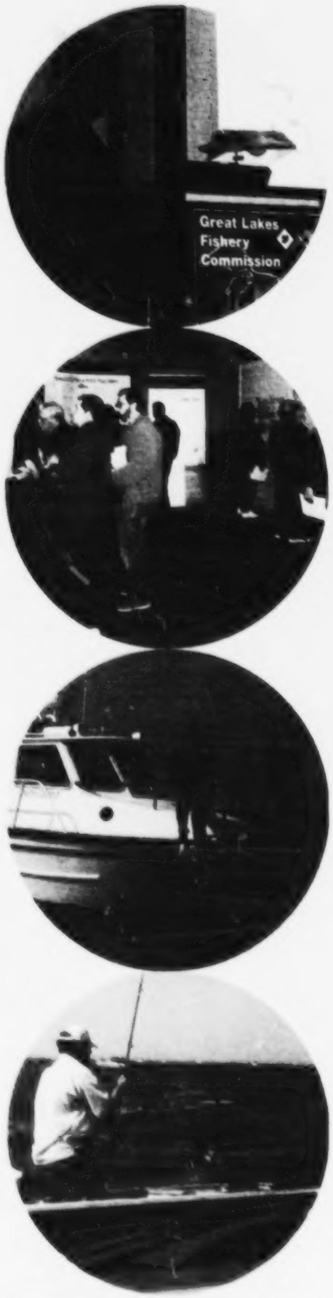
Ontario

2005 Annual Report
Lake Erie Management Unit


Great Lakes
Fishery
Commission

The Lake Erie Management Unit of the Ontario Ministry of Natural Resources is responsible for managing the fishery resources of the Ontario waters of Lake Erie, as well as the upper Niagara River, the Detroit River, Lake St. Clair, and the St. Clair River.

Ontario has been responsible for managing the fishery resources of these waters since 1898. In 1992, the Lake Erie Management Unit was created to improve Ontario's ability to manage these important resources. The Unit is based in London with field offices in Port Dover and Wheatley.

VISION: The Lake Erie Management Unit will contribute to the environmental, social, and economic well-being of the people of Ontario through the sustainable development of fishery resources within the Lake Erie basin.

MISSION: To ensure the long-term health of the Lake Erie ecosystem and to promote the sustainable harvest and development of its fishery resource through sound science, assessment, regulation, and advocacy.

GOAL: To foster and encourage the understanding of all users and partners on the complexity of managing the fishery resource of Lake Erie, to minimize conflict, and to endorse sound fishery management practices.

Lake Erie's fishery resources are managed cooperatively by Ontario and the four U.S. states – New York, Pennsylvania, Ohio and Michigan - bordering the lake through a process set out by the Great Lakes Fishery Commission and the Joint Strategic Plan for Management of Great Lakes Fisheries. Lake St. Clair's fishery resources are managed cooperatively by Ontario and Michigan under the same process.

Cover Photos: (top to bottom) –

- Andy Cook, co-chair of the Lake Erie Committee's Yellow Perch Task Group, delivers the Group's recommendations at the Committee's annual meeting in March;
- One of three public meetings held to review recommendations from the East Basin Rehabilitation Plan;
- Conservation officers on patrol in Long Point Bay, Lake Erie on the 21st Sentry;
- Opening day of bass season on Long Point Bay.

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2005 Status of Major Stocks

The following is an overview of the status of major species in Ontario waters of Lake Erie for 2005[1]. Lake-wide perspectives are available in the following reports of the Lake Erie Committee (LEC) of the Great Lakes Fishery Commission:

Walleye Task Group Report
Yellow Perch Task Group Report
Forage Task Group Report
Cold Water Task Group Report
Habitat Task Group

Walleye

In 2005, commercial catch rates for walleye increased from those observed in 2004. This is the fifth consecutive year of increasing catch rates. These increases are a result of high survival rates and the strong 1999, 2001, and 2003 year classes supporting the fishery. In contrast the 2002 year class was below average. In 2003, the young of the year index (YOY) in the west basin yielded the largest showing of young walleye for the recent time series. This year class represented 47% of the 2005 fishery, and will continue to be a dominant year class in the years to come. This is fortunate, as interagency YOY trawling in August of 2004 and 2005 revealed below average catch rates, and expectations for these year classes recruiting to the fishery in 2006 and 2007 are low.

In 2005, the LEC and the Lake Erie Management Unit completed a Walleye Management Plan (WMP) for Lake Erie. Within this plan framework, there is an exploitation policy that was used in 2005, and will continue to be used through 2006 and beyond. In conjunction with decision analysis techniques finalized in 2005 and ongoing population model refinements, this policy will help to support fisheries management on Lake Erie and optimize quality and sustainability of the sport and commercial fisheries well into the future.

The walleye population in eastern Lake Erie consists of mixed stocks including those originating from east basin shoals, the Grand River, and immigrants from the rest of the lake. Representation of walleye ages 4 and older is typically greater in eastern Lake Erie compared to other regions of the lake. The greater average age of walleye in the eastern basin is due in part to the contribution of older migratory individuals originating from the western basin. However, in 2005, the strong 2003 year class was evident in great numbers in both the fishery and in survey gear. Management options specifically designed to enhance sustainability for East Basin percid fisheries underwent public consultation in early 2005 and was implemented in April 2005.

Yellow Perch

Yellow perch populations in Lake Erie have undergone large-scale fluctuations in recruitment and survival over the last several decades. High harvest levels during the 1980's could not be sustained through the early 1990's due to low recruitment and low survival rates. Increased recruitment during the mid-1990's peaked with the exceptionally strong 1996-year class. In

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[1] Lake Erie Management Unit. 2006. 2005 Status of Major Stocks. Technical Report. 63 p.

2001, the yellow perch hatch was considered above average, it contributed significantly to the commercial fishery in 2003, 2004 and 2005. In 2002, yellow perch YOY abundance was observed to be one of the lowest on record. However, similar to the strong year class seen for walleye, the 2003 YOY trawl index for yellow perch was one of the highest on record. In 2005, this year class began to recruit to the commercial fishery, which translated into continued high catch rates and substantial allocations. It is expected that this (2003) year class will continue to support a large and healthy yellow perch fishery in the years to come. This year class will continue to make a major contribution lake-wide through 2006 and into 2007. In contrast, the 2005 yellow perch YOY index revealed lower than average catch rates, which will have an impact on population abundance when this year class is two years old and recruits in relatively low numbers to the fisheries lake wide.

Lake Whitefish

In 2005, 321,660 pounds of lake whitefish were harvested in Lake Erie by Ontario. This represents 24% of the quota, which is the lowest percent of quota attained on record. The majority of the lake whitefish harvest took place in quota area 2 (70%), with a lesser amount in quota area 1 (22%). The age composition of the harvest was broad, represented by ages 2 to 21, with the majority of fish from the 2001 year class (age 4).

While fishery trends help to describe the status of whitefish stocks, estimating recruitment of younger fish remains a challenge. Due to the migratory and schooling behavior of this species, whitefish assessment in Lake Erie is complex and problematic. During the last three years, whitefish catches have been negligible in the east basin gill net survey; however whitefish catches in the central basin gillnet survey increased in 2005. The majority of whitefish caught during this survey were from the 2001 and 2003 year classes. These year classes appear promising to the fishery in the future, with the 2001 year class already present in commercial catches. However, although the 2001 year class did recruit to the fishery in 2005, it did not substantially impact on catch rates or harvest.

2005 Project Updates

Sport Fishing Regulations

The OMNR continued to make progress on the New Ecological Framework for Recreational Fisheries Management in Ontario. Staff worked diligently to define the sport fishing division boundaries for the new Fisheries Management Zone 19 which is scheduled to take effect January 1, 2007. The new Fisheries Management Zone 19 (FMZ 19) will replace the current sport fishing divisions 1 (St. Clair River, Lake St. Clair, Detroit River) and 2 (Lake Erie, upper Niagara River). The new provincial FMZ boundaries reduce the number of fishing divisions from 37 to 20 and create larger zones based on ecological and social factors (e.g., watersheds, fishing pressure, road networks). The intention is to clearly define the boundaries for anglers and conservation officers. The new zones will also be used by fisheries staff in the future to define the areas which will be used in periodic reporting on the state of the fisheries resource.

The drafting of streamlined fishing regulations for FMZ 19, scheduled to be in place for January 2007, continued throughout 2005. The current sport fishing regulations in place in Divisions 1 and 2 were compared with the recommended standardized regulations proposed in MNR Species Tool Kits. Each tool kit provided staff with guidelines for managing sport fisheries using zone-wide regulations that are easy to understand and supported with scientific and social data where possible.

Potential sport regulations for FMZ 19 were then compared to the results obtained from the 2005 angler attitude survey (Wright, 2006 included in the Appendix) and discussed with the Lake Erie Program Committee at several meetings.

Lake Erie Program Committee

The Lake Erie Program Committee (LEPC) was initiated in 1992 as a means for Lake Erie fishery resource user groups to interact with the Ontario Ministry of Natural Resources' Lake Erie Management Unit (LEMU) on issues related to the management of the resource. The LEPC provides a forum for increased communication and transparency between the Unit and its client groups.

Membership in 2005 consisted of the following:

Ontario Commercial Fisheries Association
Peter Meisenheimer – Executive Director
Kevin Reid – Fisheries Biologist
Larry Jackson - President

Ontario Federation of Anglers and Hunters
Russ Piper – Past President and Chairman of Provincial Fish Committee
Felix Barbetti – Chairman, Zone J and Dunnville Hunters and Anglers Club
Alf Marinelli – Vice-Chair, Zone J and Port Colborne and District Conservation Club
Dave Brown – Fisheries Biologist

Bait Association of Ontario
Harold Harvey – Executive Director

Consideration is being made to broaden the membership on the Program Committee to people who represent new areas of the lakes and organizations and communities. The following people have been invited to participate at Program Committee meetings - Greg Horoky represents tournament and western basin anglers, Carlo DiLuca represents Muskies Canada and Lake St. Clair anglers, and Kennon Johnson represents Bkejwanong (Walpole Island First Nation).

Meetings were held March 17, June 6 and December 1. Meeting topics included:
status of yellow perch, walleye, whitefish and smelt stocks; pre-Lake Erie Committee review; review of Lake Erie Committee and Lake Erie Management Unit's work plans for 2005-06; ecological assessments of wetlands in southern Grand River and Rondeau Bay; provincial sport fish regulation streamlining and proposed regulations for the new zone 19; Lake St. Clair management plan and East Basin management plan.

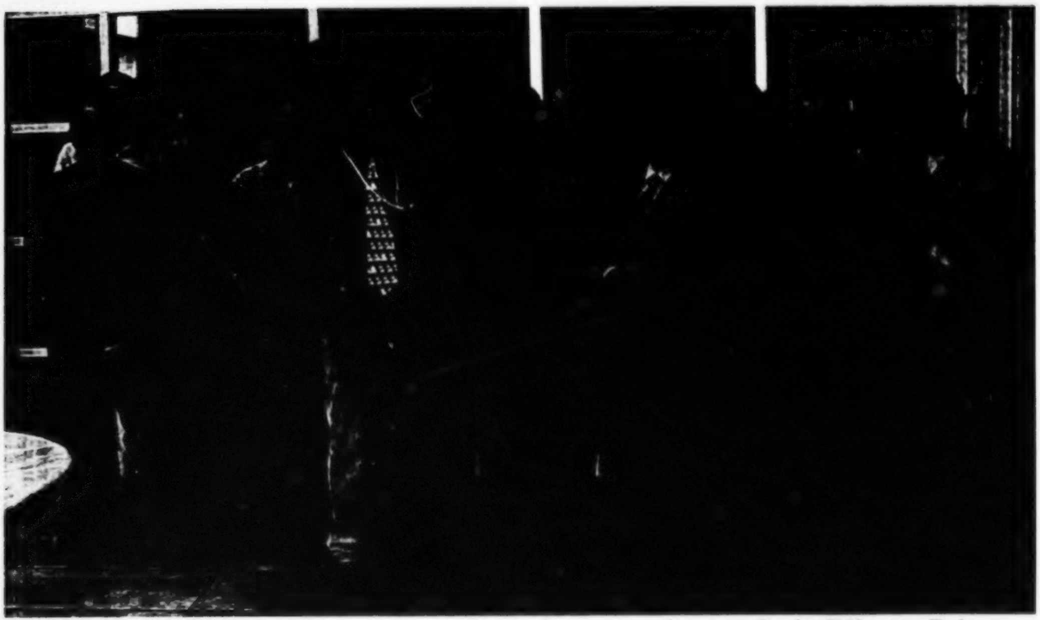

Figure 1. Lake Erie Program Committee, front row (l to r): Carlo DiLuca, Brian Locke, Alf Marinelli, John Cooper, Michael Morencie, Beth Wright, Larry Jackson, Peter Meisenheimer, Russ Piper. Back row (l to r): Jim Smith, Kurt Oldenburg, Greg Horoky, Dave Brown, Kevin Reid, Harold Harvey, John Johnson, Felix Barbetti.

East Basin Rehabilitation Plan

From 2000 to 2004, the eastern basin was managed independently under a rehabilitation initiative, with active collaboration and support of commercial and recreational fishers. During this period, the fish populations were monitored and additional work was undertaken to enhance understanding of the management issues pertaining to the eastern basin of the lake.

A draft technical report (Status of the Fish Community and Fisheries in Eastern Lake Erie[2]) summarizing the state of the current knowledge of the eastern basin was produced in late 2004. This report (hereafter EBTR) included information on:

- The ecology of eastern Lake Erie,
- Performance of the fisheries and changes in regulations,
- The economic value of the fisheries and
- The status of stocks (walleye, yellow perch, smallmouth bass, lake whitefish, rainbow smelt, burbot and salmonids).

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[2] Lake Erie Management Unit. 2006. Status of the Fish community and Fisheries in Eastern Lake Erie: Results from the 2000-2004 East Basin Rehabilitation Plan. Technical Report. 131 p.

The ecology of the eastern basin outlined in the report indicated that the fish community was different than other basins due to its physical and environmental conditions. It is a deeper, cooler and more oligotrophic environment than the rest of Lake Erie, and historically included fish species such as lake trout, lake whitefish, blue pike, lake sturgeon and lake herring. In the mid 20th century, exotic species introductions and eutrophication altered the fish community structure in the eastern basin.

During the rehabilitation period, changes were made in the commercial and recreational fisheries to support conservation and rehabilitation. These changes initially included:

- The setting of the rehabilitation zone with a western boundary on the line between grids 163 and 164 to the international border
- The establishment of the walleye cap area (also know as the Niagara cap) from the Niagara River to the line denoted by the east side of fishing grid 100 continuing to the international border
- Reduction in commercial quotas of yellow perch and walleye in the rehabilitation zone
- Commercial closure of walleye fishing from March 15 to mid May to protect spawning walleye
- Reduction in recreational daily catch and possession limits in the rehabilitation zone and lower Grand River.
- Instigation of catch and possession limit on yellow perch in the rehabilitation zone.

The value of the fisheries in the eastern basin was determined to be an estimated 22 million dollars for both the commercial and recreational fishery, with a significant recreational component (60%).

The EBTR described the status of major stocks in the eastern basin over the rehabilitation period.

- Genetic studies of walleye indicate that this fishery is a mixture of resident eastern stocks and migratory western basin stock, with the proportion changing dependant on abundance of each separate stock, and geographically, with the eastern half of the basin having a higher proportion of eastern stock origin fish. The fishery was, at the end of the rehabilitation period, still in recovery, however the 2003 year class was strong throughout the lake.
- Yellow perch were examined and did improve throughout the rehabilitation period to an extent that quota restrictions were relaxed. A definite spatial distribution in yellow perch and meristic differences in stocks were observed with high concentration of yellow perch in Long Point Bay and in the area off Port Maitland, Ontario.
- Smallmouth bass are an important recreational species that is present in coastal regions of the eastern basin. Several regulations are in place, both commercial and recreational, to protect the spawning of these fish, including sanctuaries, season closures and gill net restrictions. The inner Long Point Bay, having a more favourable temperature regime, has been determined to be major spawning habitat for smallmouth bass and this population has remained relatively stable over the survey period.
- The status of lake whitefish, rainbow smelt, burbot and salmonids were also monitored.

This document was used to provide background information about the current status of the fisheries and habitats and to support dialogue with users regarding how to manage the fisheries.

It provided a background to assist in formulating a management plan to guide the management of the eastern basin after the rehabilitation period. In 2005, this document was edited and reviewed with its release to the public in the spring of 2006. Copies of the East Basin Technical Report can be requested by contacting the Lake Erie Management Unit.

In early 2005, management alternatives on the east basin were developed by the Lake Erie Management Unit. The alternatives were presented to the East Basin Technical Committee (a group that included representatives of LEMU staff, the Ontario Commercial Fisheries' Association, the Ontario Federation of Hunters and Anglers, members of the commercial fishing industry and representatives of the Long Point Bay Anglers Association) in a facilitated meeting. The alternatives were also presented to the public in consultation sessions in February 2005 to elicit feedback (see section in this report on East Basin Rehabilitation Plan Open Houses).

Throughout 2005, the input obtained from the facilitated and public consultation sessions was evaluated, with the inclusion of information collected during the rehabilitation period, in order to formulate a management plan that would ensure continued rehabilitation and protection of stocks, while maintaining healthy sustainable fisheries. Further consultations with the Lake Erie Program Committee as well as international partners (such as New York Department of Environmental Conservation) assisted in developing a plan that will be finalized and implemented in 2006.

During 2005, the management zone border was moved eastward to the tip of Long Point south to the international border (between fishing grids 167 and 168) to harmonize it with Management Unit 4 for yellow perch. In addition, canned netting was restricted in Long Point Bay (a northward continuation of the east basin delineation) from June 1 to September 15 to enhance the recreational fishing experience in this highly used area. Maintenance of the quotas for targeted commercial species set during the rehabilitation period were maintained in 2005, pending the formalization of the management plan. The management plan will, based on information collected during the rehabilitation period, establish a mechanism for quota setting from information collected in annual surveys.

Southern Grand River Assessment

Fish habitat work, initially begun as part of the LEMU's 5-year eastern basin restoration plan, became focussed on the Grand River in 2002-2005. Building on partnerships established with local conservation clubs (Dunnville District Hunters and Anglers, Port Colborne Conservation Club, Fort Erie Conservation Club; the tri-clubs) and the Grand River Conservation Authority, and with funding from the Canada-Ontario Agreement: Respecting the Great Lakes Basin Ecosystem (COA), the program was expanded to intensively investigate walleye and habitat issues within the first 42 km upstream of the river mouth. Detailed information was collected on Grand River walleye stock migrations, demographics, and potential restrictions to production including: access to spawning substrate, water quality, and temperature/oxygen limitations. A project summary for the period 2002 to 2004 is provided in the LEMU annual report for 2004. The final year of the project, 2005, saw the completion of all field work components and the initiation of final reporting on the assessment of the southern Grand River.

Walleye assessment

The spring assessment program occurred from the last week in March until mid-May, 2005. In addition to the continuation of the previously established sampling program (walleye electrofishing, tag and release, Dunnville fishway assessment, radio-telemetry; as detailed in LEMU annual report 2004), two additional objectives were targeted in 2005: i) a multiple mark and recapture census to estimate the size of the spawning run and ii) surveys for evidence of natural reproduction (walleye egg and larvae surveys). In contrast to previous spring activities, no walleye were moved over the Dunnville dam. The reason for this was twofold: 1) to increase confidence in the census estimate and, 2) to attempt to influence the fall young-of-the-year recruitment index.

A total of 808 walleye were processed during spring electrofish sampling in 2005. Of these, 15 were recaptures of fish tagged in previous spring or fall sampling events, further evidence of the fidelity of this stock of fish to the spawning habitat of the Grand River. Of the 3125 walleye tagged during spring programs since 1994, 28 have been subsequently recaptured during spring assessment programs. Marked fish, recaptured during multiple fishing events in 2005, were used to generate a population size estimate utilizing the relationship suggested by Schnabel and modified by Chapman (Ricker, 1975[3]). Eleven mark recapture events resulted in 18 recaptures and a population estimate of 14,443 walleye (with a range of 9,334 to 23,454 utilizing a 95% Poisson estimate). This suggests a marked increase in the size of the spawning run compared to that of 2002 when a similarly derived estimate of 4,042 (2303-10,700) was generated using the same methods.

Despite the fact that walleye given direct access above Dunnville will migrate upstream to reach areas of good spawning habitat (often as far as Caledonia), most are not able to do so on their own despite the existence of the Dunnville fishway. Information gathered from tag returns, showed that walleye tagged and released below the dam tend to be recaptured below. Ninety-nine of 103 recaptures of below-released walleye were downstream of the Dunnville dam. At most, four of the walleye released below have been recaptured above; two of these were recaptured within the fishway monitoring basket while two were reported by anglers who were "relatively sure" that they were fishing above the dam.

The Dunnville fishway continued to be monitored in 2005, primarily by volunteer groups (the local OFAH "tri-clubs" as well as the Dofasco Anglers) under the direction of the COA funded field crew. An in-depth, 11 year analysis of fishway monitoring is in progress with an expected completion date of Dec 31, 2006. Preliminary results indicate that the walleye passage efficiency of the fishway, as measured by catch per unit effort (# walleye / hour of cage monitoring), has been higher in the last four years than earlier in the time series. Despite this, CPUE remains low; Mean daily CPUE ranged between 0.2 and 0.6 walleye per hour between 2002 and 2005. Estimates of the number of walleye passed each spring range from 14 to 404 per spring (145 in 2005).

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[3] Ricker, W. E. 1975. Computation and interpretation of biological statistics of fish populations. Bulletin of the Fisheries Research Board of Canada, 191.

Some walleye implanted with radio transmitter tags in 2004 were detected below the dam during the spring of 2005. This includes 3 released below the dam and 5 released above the dam. None of these fish were able to utilize the fishway or otherwise gain access above the dam.

Attempts to provide evidence of natural reproduction by walleye within the southern Grand River were inconclusive. "Spotlighting" for mature walleye at suspected spawning sites in mid-April, proved unfeasible in the turbid waters of the river. Subsurface plankton tows at locations above (11 sites) and below (10 sites) the dam between May 11 and June 23 resulted in large numbers larval fish. Lab identification of these collections revealed that while 5 species were present in the collections, none were walleye (gizzard shad and log perch were abundant). Eggs were collected from 6 cobble areas below the dam and 10 areas above the dam. These collections were preserved in alcohol and remain archived for future genetic analysis.

Three electrofish surveys directed at young-of-the-year (YOY) walleye were conducted between September 1st and 15th while weekly general walleye surveys were conducted between September 8th and October 12th. The relative abundance of YOY walleye in 2005 (mean CPUE =12.5 YOY / hour electrofishing) remained similar to the previous three years (4-year mean 12.5); notably higher than in the early years of the assessment (1999-2001; mean 1.2 YOY/hour). The presence of relatively abundant YOY indicates that walleye production is still occurring despite limited access above the Dunnville dam. Since no walleye were moved over the dam in the spring, and monitoring of the fishway indicated passage efficiencies similar to previous years, the possibility remained that the YOY were a product of the tri-club CFWIP hatchery program. To address this question, genetic analysis was conducted on 322 YOY samples collected since 2001.

Comparison of DNA from individual YOY to genetic signatures from hatchery parent fish indicated that, while hatchery produced fish contribute to the population of YOY in the river, they are only found in limited proportions. Most of the YOY in the river between 2001 and 2005 were naturally produced. In 2005, 7 of 72 YOY examined were hatchery fish. 2002 saw the largest contribution of hatchery fish at 25% of the YOY collected in fall surveys. Further, year classes followed through subsequent years (i.e. 1-yr olds in 2002, 2 yr-olds in 2003 etc.) continued to show similar relative contributions from wild and hatchery sources.

Water Quality and Environmental Conditions

Temperature and oxygen were monitored in two ways in the southern Grand River in 2005. Point-in-time water column profiles of these parameters were measured along a spatial gradient from Cayuga to Port Maitland on a bi-weekly basis. Additionally, continuous, 24/7 monitoring was conducted at a point 1m off the bottom of two deep stations within the river above the dam. Whereas previous sampling of these parameters indicated that the potential existed for extremes of temperature and oxygen within the southern Grand, these conditions were readily measured in 2005. Dry periods of low flow and high air temperatures resulted in surface water temperatures that were higher than adult walleye thermal tolerances. At the same time deeper areas of the river, where temperatures were lower, experienced anoxic conditions. In addition to periodic brief drops in oxygen, extended anoxic periods were measured in late June (11 days), mid-July (4 days) and August (3.5 days). An investigation into the spatial extent of these occurrences suggests that some stratification of the water column exists during low flow events and that areas below 3m in depth are susceptible within this section of river.

Southern Grand River Synopsis
Funding from the Canada-Ontario Agreement has allowed for the expansion of a cursory survey into a detailed examination southern Grand River walleye and fish habitat. A preliminary review of the data collected over the past 5 years in the Southern Grand River reveals a system impacted by both water quality problems and access issues for migratory fish moving upstream. Detailed reporting on individual components of the southern Grand River Ecosystem Initiative will be completed over the course of 2006. This will include an overall assessment of the Dunnville fishway, a detailed report on the walleye in the southern Grand River and a report on water quality with a focus on temperature and oxygen and flow issues. This data, along with contributions from other groups working in this section of the watershed and lake nearshore, will be used to inform a "State of the Southern Grand River" report, currently being compiled by the Southern Grand River Ecosystem Rehabilitation Working Group, a multi-agency group with representation from OMNR, Environment Canada, GRCA, MOE, and Six Nations. The "state of" report will act as a stepping stone to developing remediation plans for future rehabilitation initiatives.

Contaminant Monitoring

OMNR partners with both the Federal and Provincial fish contaminant monitoring programs on Lake Erie. Samples of walleye (western basin), rainbow smelt (west-central basin) and lake trout (eastern basin) have been collected annually for analysis by the Department of Fisheries and Oceans, Canada (DFO) as part of its Great Lakes Contaminants Surveillance Program (Table 1). Whole body burdens of polychlorinated biphenyl's (PCBs), organochlorine pesticides and trace metals such as mercury have been measured. Lake Erie consistently has the lowest level of contamination of all of the Great Lakes monitored by DFO. Results of these analyses were provided by Dr. Mike Whittle, Department of Fisheries and Oceans, Burlington, Ontario.

Fillets from various fish species in Lake Erie and the Detroit River are collected regularly and analysed by the Ontario Ministry of Environment and Energy as part of their Sport Fish Monitoring Program (Table 2). The results of these analyses, along with trends and guidelines for consumption, are reported biannually in the publication Guide to Eating Ontario Sport Fish.

Table 1. Number of fish collected from Lake Erie by OMNR for analysis by the Department of Fisheries and Oceans, Canada as part of the Great Lakes Contaminants Surveillance Program, 2005.

Species	# Requested	# Captured	Area Capture
Walleye	50	27	West Basin
Rainbow Smelt	100	100	West-Central Basin
Lake Trout	25	0	
Alewife	100	0	
Total	**275**	**127**	

Table 2. Number of fish collected from Lake Erie in 2005 by OMNR for analysis by the Ministry of Environment and Energy as part of the Sport Fish Monitoring Program, 2005. A blank cell signifies that the species was not required for that region of the lake.

Species	**Lake St. Clair**	**Detroit River (Upper)**	**Detroit River (Lower)**	**Western Basin, Lake Erie**	**Central Basin, Lake Erie**	**Rondeau Bay, Lake Erie**
Black crappie	8					
Bluegill						
Bowfin						
Brown bullhead						
Channel catfish	20		0			0
Chinook salmon						
Coho salmon						
Common carp	20		0	11	4	
Freshwater drum	20					1
Lake trout						
Lake whitefish						
Largemouth bass						20
Northern pike						
Pumpkinseed						
Rainbow smelt					10	
Rainbow trout					10	
Rock bass		3	0	0		
Smallmouth bass						
Suckers						
Walleye	20	18	6	20	20	
White bass		20	20	20	20	
White crappie						
White perch	20	0	0	20	20	0
Yellow perch	20					
Number requested (Total=371)	128	41	26	71	84	21
Number collected (Total=640)	140	80	120	100	120	80

Stocking Summary

A total of 55,000 yearling rainbow trout were stocked into Lake Erie by the Lake Erie Salmon and Trout Club in Port Stanley in 2005. Stocking occurs in late spring or early fall. The majority of these fish (48,500) were stocked into Mill Creek, a tributary of Kettle Creek, and the remaining 6,500 were stocked into Erieau Harbour. The rainbow trout were Ganaraska River strain or wild Mill Creek strain. Salmonid stocking information for 2005 from all jurisdictions around Lake Erie can be found in the 2005 Lake Erie Coldwater Task Group Report.

Rondeau Bay Ecological Assessment, 2005

Rondeau Bay is an area of focus for the Lake Erie Lake Management Plan (LaMP) and the Canada/Ontario Agreement (COA) in respect to implementation of the 2002 LaMP (MNR, MOE, Environment Canada consensus). This site contains one of the few remaining, hydrologically intact, coastal wetland systems on Lake Erie. It is also recognized as a major fish production centre within the lake basin as well as an important refuge for a number of Species at Risk (SAR). Rondeau Bay's size, geographic location, and ecotone variety also promotes a high level of biodiversity.

In a 2002 LAMP report, Rondeau Bay was identified as an impaired system based upon eutrophication and undesirable algae measures. Subsequently, COA funded, comprehensive state of the resource assessments have been occurring to identify the current ecological status of the wetland complex and the bay, the threats to this important ecoregion, and remedial actions required for rehabilitation and protection. In 2004, the fish assemblage within the bay was assessed by DFO and OMNR (Edwards *et al.*, 2005). In 2005 OMNR, along with partners Rondeau Provincial Park and Bird Studies Canada, undertook further assessments focusing on the wetland complex located within Rondeau Provincial Park. These assessments addressed information gaps pertaining to: 1) water quality within the wetland, the bay, and the inflowing tributaries, 2) aquatic macrophyte species richness and diversity within the wetland, 3) aquatic invertebrates species richness and indications for biological integrity within the wetlands and the tributaries, 3) diversity, and age structure of fish utilizing the wetland, 4) waterfowl diversity and production within the wetland complex, 5) richness and diversity of marsh birds and amphibians throughout the wetland complex, 6) bathymetry of the wetland and the bay, 7) sediment quality within the wetland, and 8) anthropogenic impacts on the bay and the wetland including shoreline alterations, nutrient loading issues, watershed land use, and invasive alien species.

The results of the assessments indicate that the wetland complex, located within the boundaries of Rondeau Provincial Park (RPP), is a relatively healthy ecosystem. However, due to land use practices throughout the watershed, serious issues exist with nutrient loading and aquatic habitat degradation within the tributaries and the bay. There is also evidence that the western section of the RPP wetland complex, which has more direct exposure to the bay and, associated watershed inputs, is also being impacted. Other serious threats include the presence of the invasive alien species, in particular, *Phragmites australis*.

Over 116 different aquatic macrophyte species representing 46 families were observed throughout the RPP wetland complex, including 21 different *Cyperaceae* spp. By comparison, 94 species were observed throughout 7 U.S. Lake Erie coastal wetlands combined. Within the Ohio EPA's Floristic Quality Index (FQI), the highest score is assigned when more than 7 Cyperaceae spp. are present. Since species from this particular family are sensitive to disturbance, their presence/absence is one measure used to assess wetland health in Lake Erie coastal wetlands.

The RPP wetland also has one of the few remaining extensive southern wild rice (*Zizania aquatica var. angustifolia*) communities along the Canadian shoreline of Lake Erie. On the U.S. side, this species is listed as threatened in Michigan and Ohio, and rare in Pennsylvania.

During the fish assessment, 29 species were identified within the wetland. This included a lake chub sucker which was last observed in 1983. An Eastern Sand Darter was also captured by RPP staff while seining along the Park's near shore bay-side habitat. This species has not been seen in the area since 1975 nor observed within the entire Lake Erie coastline for a number of years. There were also 100's of spotted gar observed, particularly along the western edge of the emergent marsh. Combined with the fish assessment which occurred in the bay the previous year, a total of 40 fish species have been observed.

The marsh bird and amphibian surveys, conducted by Bird Studies Canada, identified 40 different bird species and 8 different amphibian species throughout the wetland complex. Included in these lists were the king rail and prothonotary warbler which are both endangered and the black tern which are listed as a Species of Special Concern. The waterfowl assessment identified 8 different species utilizing the wetland throughout the summer and 22 during fall migration. The wetlands and tributaries were also used as nesting and brood rearing sites for wood ducks and mallards.

Within the RPP wetland, aquatic macro-invertebrate diversity was high, with 99 taxa representing 15 groups identified. The most abundant taxa were from the Amphipoda (scuds, sideswimmers), Ephemeroptera (mayflies), Hemiptera (waterbugs), Gastropoda (mollusks, snails), and Odonata (damselflies, dragonflies) groups. The two groups with the lowest representation were the Megaloptera (dobsonflies, fishflies) and Bivalvia (clams, mussels). Aquatic invertebrate diversity is a good indication of the habitat quality available since they depend upon diverse, and for some, specific types of vegetation for reproduction, as well as providing important food web links for fish, salamanders, birds, and others. Analysis of aquatic macro-invertebrates also helps illuminate the chemical, physical, and biological impacts, as well as the cumulative effects in overall water quality. As a whole, they have a range of sensitivities to many kinds of stressors, and since many complete their life cycles within the aquatic environment, they are exposed directly to the physical, chemical, and biological stressors present. Their wide range in life cycles from weeks to months provides integrated responses to the presence of chronic or episodic pollution events within an annual cycle.

Comparisons between the interior section of the RPP wetland and the western section (which receives more exposure to the bay and, in turn, watershed inputs), indicated discernable differences in aquatic macro-invertebrate community composition. Notable were the differences in percent *Ephemeroptera, Plecoptera*, and *Trichoptera* which were significantly higher within the interior marsh section. These taxa are known to decrease as perturbations, nutrients, organics and contaminants increase. As well, two intolerant taxa, from the *Diptera* family, were present in the marsh interior but not in the western section. Results of a Principal Components Analysis, which included a number of aquatic macro invertebrate indices, showed the community composition of aquatic macroinvertebrates within the western marsh to be more closely associated with the communities in the tributaries than in the marsh interior.

Although water quality throughout the RPP wetland was good there were also discernable differences between the interior and the western sections. Oxidation/reduction (redox) potentials were significantly higher within the western marsh compared to the interior as were NO_2-N, and NO_3-N. And, while total P was not significantly different between the western and interior sections, the highest concentrations were obtained in the west and sediment P was significantly higher as was organic C. Chloride concentrations were also significantly higher in the western marsh section. Concentrations are naturally low in freshwater systems with an average value of ~8 mg/L throughout North America. Values obtained in the western emergent marsh were more than twice this concentration at 19.4 mg/L while the interior section averaged only 11.7 mg/L. Within the tributaries chloride concentrations averaged ~75 mg/L and ranged between 28 mg/L and 167 mg/L. The main anthropogenic sources of chloride include sewage and industrial discharge and salt from road de-icing.

Water quality was poor within all of the tributaries flowing into Rondeau Bay. Visibility was minimal and nighttime dissolved oxygen concentrations at 2.2 - 3.7 mg/L were indicative of hypoxic conditions. Total phosphorus concentrations exceeded the Provincial Water Quality Guideline of 0.03 mg/L TP within all tributaries. Calculations based upon nutrient concentrations and set water volumes within each tributary indicated that at a minimum ~1 tonne of total phosphorus and ~8 tonnes of nitrate were added to the bay during June and August, 2005. Other N species added included ammonia at ~1 tonne, nitrite at ~0.9 tonnes, and total Kjeldahl nitrogen at ~6 tonnes.

As a result of this high nutrient loading, a thick vegetation/algal mat developed throughout most of the bay. This mat was so extensive it became problematic recreationally and esthetically and also created health concerns. During the growing season, the mat provided some measure of protection from nutrient loads to the RPP wetland. However, this protection was short-lived since, in the fall, strong westerly winds dispersed the senescing material, depositing large mounds along the eastern shoreline. This decaying material not only emitted a foul odour, but it smothered habitat (including the area where the eastern sand darter was located), and more than likely created anoxic zones. The bulk of the organic material was still present in the spring of 2006.

Another serious threat identified to this system was the presence of invasive alien species. A number of non-indigenous vegetative species were observed within the bay and the wetland complex including giant reed (*Phragmites australis*), purple loosestrife (*Lythrum salicaria*), Eurasian watermilfoil (*Myriophyllum spicatum*), flowering rush (*Butomus umbellatus*), reed canary grass (*Phalaris arundinacea*), great manna grass (*Glyceria maxima*), floating heart (*Nymphoides peltatum*), curly pondweed (*Potamogeton crispus*), and Russian Olive (Elaeagnus angustifolia). Invasive faunal species included the zebra mussel (*Dreissena polymorpha*) and Eurasian carp (*Cyprinus carpio*).

The presence of Dreissenids throughout Lake Erie have been credited with the demise in native bivalve populations. Recent evidence indicates that some coastal wetlands may be providing refuge habitat for remnant populations. Investigations specifically targeting these species within the Rondeau Bay wetlands is required and warranted.

The most extensive and negatively impacting vegetative species within the RPP wetland complex was the giant reed (*Phragmites australis*). The presence of this plant was particularly dense within buttonbush swamps located in the interior of the wetland complex. At these sites the native vegetation was measurably less diverse. This particular invasive alien species is extremely difficult to control and/or eradicate due to the extensive rhizomes which grow to depths of 2 meters and roots which grow even deeper. It thrives in areas of poorly aerated sediments where wave or current action is low to non-existent. The challenges posed by this species require immediate and concerted efforts to stem further spread and to reduce its current coverage.

Some of the remaining information gaps identified that require further investigation in 2006 include:

1) determination of diurnal dissolved oxygen trends within the bay and the tributaries
2) determination of tributary nutrient and sediment loading rates
3) assessment of the status of the wetland systems located outside of the RPP boundary
4) identification of potential sites to establish buffer strips, lagoons, treatment wetlands and other pollutant reducing measures
5) summary of land use within the watershed
6) identification of potential shoreline property suitable for wetland restoration
7) assessment of the bay habitat including algae and macrophyte species identification and biomass, aquatic macroinvertebrate species richness and diversity

The ultimate goal of these assessments is to identify the key problem areas to effectively guide and focus restoration initiatives. Since the tributaries, the bay, and the wetlands are not functioning in isolation of each other, implementation of best management practices throughout the watershed will have numerous beneficial impacts. The end result could well be the restoration of this system to a high value, highly productive, and extremely important natural heritage jewel upon the Lake Erie landscape.

2005 Lake Erie Committee Activities

The Lake Erie fisheries resources are managed cooperatively by the Lake Erie Committee (LEC) comprised of fisheries managers from Ontario (represented by the LEMU Lake Manager), Michigan, Ohio, Pennsylvania, and New York State. Under the auspices of the Great Lakes Fisheries Commission, the LEC manages the fisheries resources by consensus derived decision making and together with their joint Task Groups (LEMU staff participate on the five Task Groups[4]), the LEC uses a variety of initiatives to assist their decisions. The following is a summary of various initiatives that the LEC and Task Groups were working on in 2005.

Decision Analysis

The Decision Analysis (DA) Team completed their report documenting the Decision Analysis Application for Lake Erie Walleye Management[5] in 2005. The report is available on the Great Lakes Fishery Commission website (www.glfc.org).

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[4] Task Groups: Cold Water Task Group, Forage Task Group, Habitat Task Group, Yellow Perch Task Group, Walleye Task Group

[5] Wright et al. 2005. Decision Analysis Application for Lake Erie Walleye Management: Final Report to the Lake Erie Committee. 18 p.

Decision Analysis (DA) is intended to help make complex decisions more manageable by specifying objectives, uncertainties, options and risks. The LEC developed objectives for the walleye fisheries and the DA team worked to assess uncertainties, options and risks to the fisheries. A Lake Erie walleye fisheries simulation model was developed by Dr. M. Jones, and W. Dai at Michigan State University with the assistance of the DA team and Dr. J. Bence (Michigan State University). The model illustrated long-term outcomes using several fishing mortality rates and showed that the Lake Erie walleye population was more influenced by recruitment than it was by fishing mortality.

Informed by the DA simulation model, and using the LEC objectives, the LEC decided that future walleye fisheries management would, beginning in 2005, use a sliding fisheries mortality option. This management option was developed to reduce walleye exploitation when abundance was low and safely exploit the resource when abundance was high.

Walleye Management Plan

The following is a summary of the primary components of the LEC's Walleye Management Plan[6] (WMP). The WMP is available on the Great Lakes Fishery Commission website www.glfc.org.

The Lake Erie Committee (LEC) is a bi-national committee of state and provincial fisheries agencies operating under the auspices of the Great Lakes Fisheries Commission (GLFC) to manage fish communities and fisheries in Lake Erie. The LEC agencies include the Michigan Department of Natural Resources (MDNR), the New York State Department of Environmental Conservation (NYSDEC), the Ohio Department of Natural Resources (ODNR), Ontario Ministry of Natural Resources (OMNR), and the Pennsylvania Fish and Boat Commission (PFBC). The LEC uses the Joint Strategic Plan for Management of Great Lakes Fisheries as a guide for managing internationally shared resources. One such resource is the Lake Erie fishery. This fishery is composed of a number of species that are highly sought by commercial and sport fisheries. The U.S. Jurisdictions all have sizable sport fisheries, and to a lesser extent, commercial fisheries for yellow perch, white bass, lake whitefish and coarse fish. Ontario maintains a large commercial fishery, and to a lesser extent recreational fishery that utilizes these species as well. Both walleye and yellow perch are managed on an allocation basis, with portions of biologically determined total allowable catches (TAC) shared between jurisdictions.

In the case of walleye on Lake Erie, this species is of enormous economic importance to all jurisdictions. It is therefore imperative that any management objectives for this species be aimed first at the sustainability of the population and second to maximize societal benefit for all jurisdictions. Further, the fishery must be allocated fairly and in a transparent and biologically justifiable fashion. In order to achieve this, managers require a decision making process that has clear objectives both for the fish population and the harvests associated with it. These objectives need to be supported by a management regime that will ensure that resource sustainability is maintained, that the walleye population continues to support fisheries of a high quality, and is in keeping with the LEC's Fish Community Goals and Objectives for Lake Erie. To this end, this document presents a brief recent history of walleye management on Lake Erie, the current status of this important species, fishery and fish population objectives, and management tools for the LEC will use to ensure that the objectives are met.

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[6] Locke et al. 2005. Lake Erie Walleye Management Plan. Report to the Lake Erie Committee. 45 p.

Scope and Purpose of the Walleye Management Plan

This plan establishes fishery sustainability and quality objectives that the LEC will employ as a basis for walleye management. This plan focuses primarily on the walleye stocks that spawn on shoals and in tributaries of the Western Basin, and generally inhabit the West and Central Basins of Lake Erie. This is the primary population of interest to the LEC management exercise as it provides most of the benefits to users throughout Lake Erie. There are additional stocks within the Lake, and these are found East of Long Point, in the Eastern Basin. Catch at age modelling and population estimates for this Eastern population remain problematic, but it is clear that the population is small relative to the Western population.

This new plan takes advantage of lessons learned and models developed during the previous 5 years. This management plan will form the basis for all future work towards managing walleye stocks in Lake Erie. This plan will be dynamic and continue to change with advances in assessment technology and fisheries theory.

It will be important for future sustainability of walleye that this population has an age structure that allows it to consistently provide stable fisheries and sufficient spawner biomass. In order to accomplish this, a more thorough understanding of population dynamics is necessary so that effective management actions can be implemented accordingly. The LEC and the Walleye Task Group (WTG) are working to increase understanding of population dynamics such as the walleye stock-recruit relationship, quantifying uncertainties in the models and evaluating risk strategies for various rates of exploitation, and mortality. Research initiatives are underway to delineate stocks and understand the influences of stock size and environmental variability on percid recruitment. These efforts, and others, such as the Decision Analysis (DA) initiative strengthen the WMP in that they inform managers as to the options available to them, and help them to understand the potential effects of their management actions.

Central to the WMP are two main components. The first are population objectives that define the biological and fishery quality characteristics that the LEC in cooperation with stakeholders has set for the Lake Erie walleye population. The second is an exploitation policy that has been designed to help meet these objectives while at the same time maximize the economic benefit of the walleye fishery to stakeholders. This exploitation policy does so by marrying state of the art population and harvest simulation modelling with lessons learned from other fisheries and the recent history of walleye management on Lake Erie.

Walleye Fishery and Fish Population Objectives

The LEC manages the entirety of the Lake Erie Resource using the Fish Community Goals and Objectives for Lake Erie[7]. As a terminal predator, walleye are a key component of the Lake Erie Ecosystem, and any management of this species must take this fact into consideration. For example, mismanagement of this species, to either end of the population abundance spectrum, could potentially lead to instability in the fish community, and have subsequent negative impacts on the integrity of the ecosystem or on other economically important species. Moreover, as an important commercial food fish, and a desirable sport fish species, walleye need to be managed for these uses as well. Ideally, this management objective should occur within the context of first sustainability, second ecosystem integrity, and economic benefit third.

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[7] Ryan, P.A. et al. 2003. Fish-Community Goals and Objectives for Lake Erie. Great Lakes Fish. Comm. Spec. Publ. 03-02. 56 p.

Sustainability Thresholds for Walleye

Defining a minimum population size (a level of abundance from which a population can not recover in a reasonable time frame) is difficult if not impossible. For walleye in Lake Erie, the relationship between numbers or biomass of spawners and subsequent recruits is typically weak, with environmental influences greatly masking the effects of stock size on recruitment. In the case of other fisheries, the only time these thresholds are observed is after they have been exceeded. It may be simpler, therefore, to set a level for sustainability at a population size that causes fisheries to take on negative attributes. These attributes can include, but are not limited to a reduction in catch rates that lead to declining angler interest, or make the economics of the commercial fishery problematic. Additionally, when populations are reduced to low levels of abundance, they tend to take on other attributes that increase the risk of overexploitation. These include a reduced number of year classes causing a simple age structure that can lead to low levels of spawner biomass, or dependence of fisheries on single year classes. This can cause TACs and harvest to vary wildly on an annual basis (particularly at fixed exploitation rates), and is extremely risky from a stock conservation standpoint.

The population abundance of walleye in recent years (1999 – 2000) was a level of abundance that created the negative attributes described above. Both commercial and sport fishery catch rates were at 10-year lows, and all jurisdictions had difficulty attaining their portions of the TAC. This year 2000 population level should be considered one which LEC should seek to avoid, and should employ strong management actions to do so. The LEC has determined that the population abundance observed in 2000 is a critical minimum for the quality of fisheries, and is problematic for the sustainability of the resource. Therefore, the LEC maintains that dramatic management action in the form of reduced harvest levels will be warranted should the population fall below this level.

LEC Fishery Goals and Objectives for Walleye

In order to ensure that the walleye population is sustainable and is of sufficient abundance to meet fishery quality objectives, the LEC has developed the following objectives:

- *Maintain walleye catch rates at average or better levels,*
- *Maintain sport and commercial walleye harvest to average or better levels*

To satisfy these objectives, the walleye population should have an average size of approximately 26-40 million fish. Additionally, the age and size structure of the fishery should be sufficient to:

a) Promote migration of walleye towards the Eastern Basin of the lake,
b) Provide diverse fishing opportunities to anglers; and
c) Provide sufficient numbers of commercially desirable fish.

These objectives should be achieved when the population size is between 26 and 40 million fish, and the fishery is not dominated by only one year class. The following population abundance categories have been identified by the LEC:

Age 2 and Older Walleye	Category
<15 million	Crisis
15-19 million	Rehabilitation levels
20-25 million	Low quality
26-40 million	Maintenance
>40 million	High quality

Ancillary management tools that act to promote genetic diversity, and generally act to buffer or enhance the effect of management actions should also be implemented, but due to the difficulty in measuring their impact (e.g. their place as a modifier of the spawner recruit relationship), they extent to which they should be employed can't be adequately described. Therefore, the LEC chose to focus on methods that could be simulated and/or reviewed within the context of contemporary knowledge of Lake Erie Walleye.

In order to influence walleye population abundance to the extent that it is possible using direct management tools, it is clear that an exploitation policy should be central to any management plan for the species. This policy should do four basic things.

1) Ensure the sustainability of the walleye population
2) Help to maintain walleye within the maintenance threshold set out by LEC
3) Allow user groups to take advantage of large walleye populations
4) Be straightforward enough that its implementation will be simple to understand, and can rely on current stock status information.

To do these things, it is critical that the current knowledge of the walleye population be described and understood, and that past management actions be reviewed. Further, examining this information using simulation modeling in conjunction with decision analysis, it is possible to generally predict the impacts management actions on the population that could be expected in the future. By doing so, an exploitation policy that fulfills the above four criteria can be created.

WMP exploitation policy

As discussed earlier in this document, the WMP seeks to set exploitation policy using both a historical approach (to examine empirical and theoretical ramifications of various levels of harvest) in combination with decision analysis and population simulation modeling (for policy evaluation). To do this, the LEC examined fishing rates that it has applied or observed for Lake Erie walleye, and looked to the literature for guidance. Simulation models from a Decision Analysis project then were used to test and forecast the impact of the resulting policy.

The LEC walleye population objectives lend themselves well to exploitation policies that vary depending on population abundance estimates. The DA team, and the LEC have dubbed this type of approach a feedback approach. Feedback refers to the fact that the exploitation policy is informed by population abundance, is used to set exploitation rate, then is re-informed in the subsequent year by the new population abundance, and a new and different exploitation policy is set.

This approach enables the LEC to reduce fishing mortality when the population abundance is low and take advantage of periods of high abundance by increasing fishing mortality. Several approaches were discussed and or tested using simulation models using a variety of levels of fishing mortality. For example Figure 1 shows an early feedback policy tested by LEC and the DA team.

It was decided that empirically derived levels of fishing mortality (F) should be used to begin setting out the policy. Figure 1 uses a low level of F between15 and 20 million walleye (approximately 0.2) that is comparable to the exploitation rates used during the CPMS. These levels of fishing mortality were sufficiently low that they arrested population decline, and all but eliminated the influence of harvest on the population. In contrast, the upper level selected for this early policy is set at a level corresponding to the maximum fishing rate on a Beverton-Holt curve. This level is the maximum that LEC feels is safe, and is an excellent analogue for an optimal MSY rate harvest. In the policy, levels of fishing mortality decrease from this high F with population size in steps (created by the population stages of the LEC policy) in order to promote population growth and maintain spawner biomass.

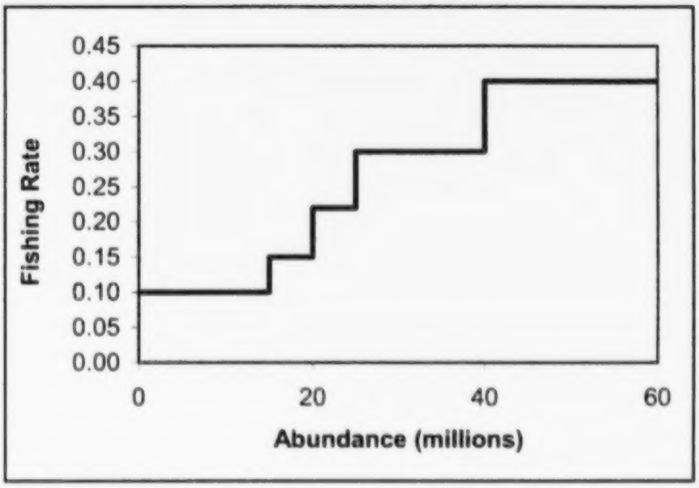

Figure 1. An early feedback policy tested and discussed by LEC. Notice that the steps on the curve approximate the changes from one population state to another (as described above).

This type of approach was ultimately rejected as there was some concern at LEC about the rapid changes in targeted Fishing mortality that relatively small changes in abundance estimates would indicate. This would result in TACs that could vary wildly on an annual basis. Additionally, it is not uncommon for a subsequent year's population estimates to slightly revise past stock size estimates. This could result in rapid changes occurring in targeted fishing mortality that were found to be unnecessary in the year following allocation. This could have real economic ramifications for stakeholders, and would undermine the credibility of the process. Additionally, there was no mechanism to "decelerate" the levels of harvest when a transition level was being approached. It was also decided that fishing mortality rates above 0.39 are be excessive, and could compromise the broad distribution of benefits that are typically enjoyed as the walleye population peaks in abundance.

Upon further deliberation, the LEC described a feedback policy which is now referred to as the sliding F policy. The resulting policy is illustrated in Figure 2, and will be used for the foreseeable future by LEC to manage walleye.

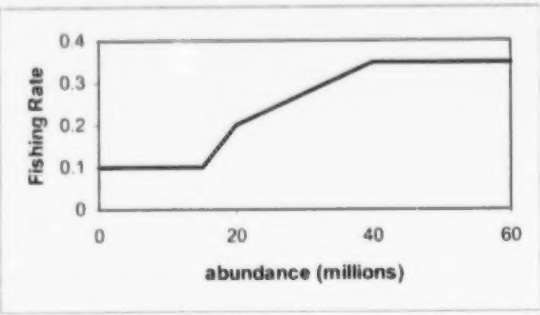

Figure 2. LEC sliding F policy for walleye management in Lake Erie.

This policy uses the mean targeted walleye fishing mortality (described in an earlier section) as the maximum F allowed, and employs it when the population exceeds 40 million fish. At 20 million fish, a value of 0.2 is used, and the resulting curve will be used to set fishing mortality levels on an annual basis. The lowest level of F in this policy is 0.1, and will be employed when the population falls below 15 million fish.

This exploitation policy was tested using the Decision Analysis 9 simulation model, with the results considered favorable by the LEC with respect to its objectives. The DA, its mechanisms, assumptions and methods is described in detail in Wright et al. (2005)[8]. Table 3 summarizes the DA simulation outputs with respect to 6 parameters of interest that are key to understanding the impact of walleye exploitation policies on the population, and can be used to evaluate/compare different policies.

Table 3. Summary of DA simulation outputs for the LEC sliding F policy modified from. All simulations are over a 50 year period.

	LEC Policy
Mean number of 2 year old and older walleye	47.4 M
Mean number of 4 year old and older walleye	15.8 M
Percentage years below 15 Million walleye	1.0%
Percentage of years below 15 Million walleye for more than 3 years	4.0%
Percentage of years below 25 Million walleye	15.3%
Percentage of years below 25 Million walleye for more than 3 years	11.5%

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[8] Wright et al. 2005. Decision Analysis Application for Lake Erie Walleye Management: Final Report to the Lake Erie Committee. 18 p

If the WMP exploitation policy works as it is intended, the walleye population abundance will remain within the maintenance zone most of the time, with variance from this state driven primarily bye short term fluctuations in recruitment. Any dramatic shift from this state will be driven primarily by changes in carrying capacity or other major ecosystem change. Because these changes typically occur over a span of years, the effect of the WMP can not be understood without the benefit of allowing those years to pass. Therefore, the true test of the policy will be to examine whether or not on average and over time, the abundance of walleye remained within the LEC maintenance range. This will then ultimately lead to a sustainable walleye population that on average provides excellent opportunities for both the recreational and commercial fisheries that utilize this wonderful fishery resource.

Yellow Perch Management Plan

The Lake Erie Committee (LEC) is developing a management plan for yellow perch (YPMP) as a companion document to the existing Walleye Management Plan (Locke et al. 2005)[9]. The plan will support broad goals and objectives for managing yellow perch as described in Fish-Community Goals and Objectives for Lake Erie (Ryan et al. 2003[10]). In addition, the YPMP will include specific management tactics designed to maintain quality commercial and sport fisheries. The plan will outline the decision making process, review historic management practices, identify sources of uncertainty and discuss overlapping concerns with yellow perch management. Recent efforts have focused on developing management objectives based on fishery quality and risk-based performance measures. Major components of the YPMP will be dependent on annual assessment results presented by the Yellow Perch Task Group (YPTG) to the Standing Technical Committee. Completion will follow resolution of outstanding YPTG population model charges and a review of the proposed Yellow Perch Management Plan.

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[9] Locke et al. 2005. Lake Erie Walleye Management Plan. Report to the Lake Erie Committee. 45 p.

[10] Ryan, P.A. et al. 2003. Fish-Community Goals and Objectives for Lake Erie. Great Lakes Fish. Comm. Spec. Publ. 03-02. 56 p.

2005 Outreach Updates

Angler Outreach

For the ninth year, the Lake Erie Management Unit hosted a series of meetings for Lake Erie and Lake St. Clair area anglers. For the first time, there was no conflict between weekday evening meetings and Stanley Cup playoffs because of the hockey player strike. As a consequence, attendance was up 46 percent over 2004.

Changes for 2005:

- East Basin Plan displays set up in Port Colborne, Dunnville and London
- agenda topics reduced and time of meeting shortened
- changed location of Grand River-area meeting to Dunnville
- new location for London meeting – Westmount Library

2005 Attendance – 270, with 103 new additions to mailing list.

April 13 – Port Colborne 71 people (34 new)

- best turnout ever
- lots of interest in eastern Lake Erie and southern Grand River
- cormorants an increasingly important topic
- local outdoor writer had promoted the meeting as 'Angler Outrage' as a result of wrong information that commercial quotas were going up in the eastern basin
- Welland Tribune reporter in attendance

April 14 – Dunnville 22 people (10 new)

- First time in Dunnville – follow-up to East Basin plan open house
- Concerns raised about cormorants and gill-netting off mouth of Grand River
- Dunnville Chronicle reporter in attendance

April 16 – Simcoe 72 people (6 new)

- Guest speakers at Long Point Bay Anglers Association's annual meeting
- Some members of audience quick to criticize MNR on reneging on yellow perch harvest restrictions during 5 year plan, but club president pointed out to members that this was the best news from MNR in 20 years.
- Concern raised about proposed regulation change to stop spearing of pike in the spring
- Reporters from Simcoe Reformer and Port Dover Maple Leaf in attendance

April 19 – London 21 people (13 new)

- new location, but still not well attended
- many members from local Bassmasters club in attendance, and interested in information on bass fishing in Lake St. Clair and Long Point Bay

Comments:

- wanted update on Springbank Dam/fishway
- asked about genetics of stocking walleye into the Thames River (and why not mix stocks?)
- asked about contaminant issues with eating perch, especially perch that feed on gobies

April 20 – Chatham 35 people (16 new)

- Back in Chatham after two years in Wallaceburg
- Representative from Chatham-Kent Tourism in attendance

Comments:

- asked for update on cormorant issues
- wanted more information on Thames River walleye eg. why is there no reproduction
- asked why commercial fishers can catch walleye in spring when anglers have closed season
- asked for update on Fanshawe Dam

April 21 – Windsor 49 people (24 new)

- attendance down despite effort by some local anglers to stir up interest in the meeting regarding the walleye quota increase
- Presentation by representatives from Windsor-Essex travel and convention bureau on their work to promote sport fishing
- CBC radio attended first half of meeting.

Comments:

- Considerable interest and comment on commercial fishing, the 143% walleye quota increase and lack of changes to walleye angler regulations for western Lake Erie
- Still a lot of support for two lines on Lake St. Clair
- much support for a 2 day walleye and yellow perch possession limit
- how much walleye are commercial fishers taking beyond their quota
- what are rainbow trout eating
- will there be any change in the future sport regulations for smallmouth bass because there are no smallmouth bass young of the year

East Basin Rehabilitation Plan Open Houses

Open houses were held from 2 to 5 pm and 6 to 9 pm in Port Colborne (February 15), Dunnville (February 16) and Simcoe (February 22). About 170 people attended the three open houses. 115 people completed questionnaires regarding the different management options.

Two display units were used to hang the walleye and yellow perch alternatives posters and relevant questions from the questionnaire. Posters on overall questionnaire, Grand River marshes, Grand River walleye, and Grand River partners were posted as well.

Commercial Outreach

Three outreach meetings were held in February with members of the Lake Erie commercial fishing industry. The meetings, held the Port Dover Fisheries Station (morning of Feb 22nd), the Port Stanley Fire Hall (afternoon of Feb 27th), and the Wheatley Legion Hall (evening of Feb 27th) were well attended by commercial fishers, representatives of the Ontario Commercial Fisheries' Association and LEMU staff.

As in past years, the Lake Manager discussed the state of the fisheries (e.g., strong 2003 year class of walleye and yellow perch), issues of concern to commercial fishers (e.g., raise in royalties), ongoing and future initiatives with the LEMU and the LEC (e.g., wrap up of the East Basin initiative, development of a Yellow Perch Management Plan). The floor was open to questions and comments from all in attendance. The attendees expressed optimism about the walleye and yellow perch fisheries for 2006-2007 given the strength of the 2003 year classes, and all looked forward to receiving the annual commercial quotas for 2006.

Other Outreach

OCFA convention	January 15-16
Norfolk County council	February 15
Windsor, Essex County and Pelee Island Convention and Visitor's Bureau 'Fish On' Sportfishing seminar	March 1
Toronto Spring Fishing Show	February 18-20
AMA Sportsmens Club	June 5
Windsor Sportsmens' Club	June 20
Long Point Bay Anglers Association 'Day on the Bay'	July 13

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2005 Project Reports

Seven project reports, completed during 2005-2006, are included at the end of the Annual Report.

Yearling Walleye Study, 2004
Report by: A. Cook, B. Sutherland, M. Belore, and B. Locke

Lake Erie Western Basin Access Creel Survey, 2005
Report by: S. Bartnik and B. Locke

Young-of-the-year Fish Index Survey in the Canadian Waters of Lake St. Clair, 2005
Report by: S. Bartnik, S. Powell, and B. Locke

Lower Thames River Larval Walleye Index Survey, 2004-2005
Report by: S. Bartnik, S. Powell, and B. Locke

Lake Erie Basin Annual Report 2005/2006 (Canada-Ontario Agreement)
Report by: R. Drouin

2003-2004 Lake Erie/Lake St. Clair Angler Attitude Surveys Report
Report by: E. Wright

2005 Angler Attitude Survey Report on Angling Regulations
Report by: E. Wright

Yearling Walleye Study, 2004

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In 2004, a study describing the catch of walleye in gill nets targeting yellow perch was undertaken from July to October in western Lake Erie. The design followed a study conducted in 2000, which focused on incidental catch of the strong 1999 year class. The 2004 study focused on the 2003 year class, assessed to be much stronger than the 1999 year class according to interagency trawl surveys.

Methods

The 12 study locations were fixed, based on the 1999 distribution of commercial effort targeting yellow perch. Sites were moved on occasion in order to avoid interference from commercial gear. At each site, two commercial panels of 57 mm (2.25" stretched mesh) net 15 and 24 meshes deep, 37 m long and index nets with mesh sizes 32, 38, 44, 51, 57, 64, 70, 76, 89, 102 mm (1.25" to 4.0") were fished on the bottom overnight. Index nets with mesh sizes 32, 38 and 44 mm consisted of single 15 m (50 feet) panels, whereas larger index mesh sizes had two 15 m panels. Commercial nets and the gang of index nets were separated by a long bridle to reduce leading effects. All fish were retained for counts and weights measured in the laboratory. Biological data were collected from all walleye and from 40 yellow perch collected from each gear type and site.

Mean catch rates of 57 mm gill nets 15 and 24 mesh deep expressed as yearling walleye per km are presented spatially by month in Figure 1. Monthly length distributions of walleye caught in index gear representing all sizes of walleye, along with length distributions of walleye caught in 57 mm gill nets are illustrated in Figure 2. Yearling walleye catch rates in 57 mm gill nets 15, 24 and 36 meshes deep respectively are presented by month for walleye by number and weight per km and by net area in Table 1. Reported monthly commercial gill net effort with mesh sizes less than 76 mm (3") was applied to survey catch rates for 57 mm nets with 15, 24 and an average of 15 and 24 meshes deep to estimate commercial incidental catch for comparison with reported harvest of yearling (commercial number 2) walleye (Table 2). Yearling walleye catch rates (number / km) in 57 mm nets were tested for significant differences ($\alpha = 0.05$) between nets 15, 24 and 36 meshes deep using paired T tests, Sign tests and Signed Rank tests (Table 3)(proc univariate, SAS v8.03). The applicability of each test was based on the Shapiro-Wilk test for normality. When the assumption of normality was met ($\alpha = 0.05$), a paired T test was referenced. Non-parametric paired tests were applied when the assumption of normality was not satisfied. The same tests were applied to yearling walleye catch rates expressed according to net area (yearlings / m^2) (Table 4) and for yellow perch catch rates expressed as kg / km (Table 5) and kg / m^2 (Table 6).

Yellow perch catch rates in 57 mm 15, 24 and 36 mesh deep gill nets are presented in Table 7 for comparison with yearling walleye catch rates. Since the efficiency of gill nets capturing yellow perch was dependent on depth of net (Table 5), the relative catch of walleye was calculated based on the fraction of net required to catch yellow perch multiplied by the catch of yearling walleye in each respective net configuration, expressed as a fraction of walleye catches in nets 15 meshes deep (footnote Table 7). These values can be used to describe the relative incidental walleye catch in yellow perch gill nets in configurations other than nets 15 meshes deep.

Reported commercial harvest (lbs) of category "number 2" walleye (approximately <381 mm total length) is presented by month for each quota zone in Figure 3. Similarly, commercial small gill net mesh effort (<76 mm or 3") reported in 2004 is described monthly, along with mesh size and net depth configurations used in each quota zone (Figure 4). Cumulative yellow perch harvest (%) by month is also presented in Figure 4 by quota zone for reference.

Results from studies conducted in 2000 and 2004 are presented in Table 8 for comparison. Monthly yearling walleye catch rates (number/km, kg/km) in 57 mm gill nets 15, 24 and 36 meshes deep from both studies are presented in conjunction with reported monthly commercial gill net effort (<76 mm) to estimate commercial catch of yearling walleye in 2004.

Results and Discussion

Yearling walleye were not caught in 57 mm commercial style nets (15 and 24 meshes deep) in July (Table 1, Figure 1). Juvenile walleye began to appear in these nets during August, but catches increased progressively, peaking in October. Increased vulnerability to 57 mm mesh was associated with seasonal growth as indicated by the length distributions in graded mesh index nets (Figure 2). By October, the length frequency distribution of walleye in 57 mm nets closely resembled the distribution of the entire index gang, indicating peak vulnerability to 57 mm was attained by October. Peak vulnerability to 57 mm gill nets in October lead to the highest estimates of incidental walleye harvest during the study period (Table 2). This was also reflected by reported monthly commercial harvest of number 2 walleye in quota zone 1 (Figure 3). Peak incidental harvest in October may be attributed in part to the seasonal distributior of gill net effort which peaked in October (Figure 4).

Significant differences existed in yearling walleye catch rates (walleye / km) between 15,24 and 36 mesh deep 57 mm nets during August, September and October with higher catch rates associated with greater net depth (Table 3). Although the deepest net (36 mesh deep) always had the highest catch rates

(Table 1), there were no significant differences between yearling catch rates between gears when expressed by area of net (Table 4), suggesting that vertical densities of walleye did not differ appreciably from the lake bottom to the cork line of the deepest net (36 mesh deep 57 mm index nets). The ability to detect such differences may be limited by the monthly sample size of 12 sites.

Yellow perch catch rates (kg/km) were generally greater in 24 and 36 mesh deep nets compared to shallow profile nets 15 meshes deep (Table 5). When yellow perch catch rates were expressed according to net area (g/m^2), there were some significant differences between gill nets of different depths ($\alpha = 0.05$). Where significant differences by area existed, shallower profile nets exhibited the higher catch rates, reflecting the demersal behavior of yellow perch (Table 6). Yearling walleye catch rates in 57 mm gill nets increased monthly, approaching yellow perch catch rates in October in commercial style nets (15 and 24 mesh deep), but exceeded yellow perch catch rates in 57 mm index nets 36 meshes deep (Table 7).

If a gear restriction favoring shallow profile gillnets was considered, it should consider not only the vulnerability of walleye to the gear, but also the efficiency of the gear capturing yellow perch. Gear with higher yellow perch catch rates require less effort (km of gill net) to attain yellow perch quota. The exclusive use of 57 mm gill net 24 meshes deep would have resulted in 6% and 42% more yearling walleye caught compared to nets 15 meshes deep in August and September, respectively when the efficiency of capturing yellow perch was taken into account (Table 7). There would have been virtually no difference in the catch of yearling walleye between gill nets 15 and 24 meshes deep in October, based on the efficiency of the nets to catch yellow perch, combined with the vulnerability of walleye to each gill net configuration. The benefit of using the shallowest profile yellow perch nets (15 mesh deep) to reduce incidental walleye catch in 2004 was limited primarily to the month of September. The index style 57mm 36 mesh deep nets would catch more walleye compared to the shallower nets (15 and 24 mesh deep) in August, September, October and possibly in later months, when the capture of yellow perch and walleye are taken into account (Table 7).

The yellow perch fishery used mostly mesh sizes 2 3/8" (61mm) and smaller to target yellow perch in quota zone 1 in 2004, with 2 ¼" (57mm) being most common (Figure 4). Yellow perch fisheries in quota zones 2 and 3 also used mesh sizes predominantly 2 3/8" and less, but 2 5/16" (59 mm) was the most common mesh size fished. The majority of commercial yellow perch gill nets fished were 15, 20 and 24 meshes deep in 2004, in proportions that varied seasonally (Figure 4). Yellow perch gill nets 24 and 20 meshes deep were used more than 15 mesh deep nets in 2004, though 15 mesh deep nets represented a larger proportion of yellow perch gill net effort in quota zone 3.

Estimated walleye harvest in yellow perch nets was presented for several 57 mm mesh gear configurations, with nets 24 meshes deep or an average of 15 and 24 mesh deep nets being most applicable for commercial practices (Table 2). Estimated walleye harvest ranged approximately from 4 to 6 times the reported harvest of number 2 walleye by number and weight (Table 2) over the study period. Some differences could be attributed to overnight fishing during the study compared to mandatory commercial "daylighting" during the months of July to September. No such restriction was in effect during October, however, and estimated yearling walleye harvest ranged from 4 – 7 times the reported harvest of number 2 walleye by weight. Alternatively, spatial differences and/or other fishing techniques could account for some of the discrepancy. Factors including discard and reporting accuracy may have also contributed to differences between estimated and reported walleye harvest in small mesh gill nets.

Results from yearling walleye studies conducted in 2000 and 2004 exhibited similar patterns albeit with different scales of magnitude (Table 8). Yearling walleye catch rates and estimated harvest in yellow perch gill net configurations were approximately 3 to 4 times higher in 2004 than in 2000 over the same study period. This can be attributed primarily to the greater strength of the 2003 year class. Yearlings appeared to recruit earlier to 57 mm gill nets in 2000, likely because the 1999 year class was larger in body size compared to the 2003 year class. Reported commercial yellow perch gill net effort from July to November in 2004 was 15% less than reported in 2000, but with differences in the seasonal distribution of effort that likely elevated incidental harvest (Table 8).

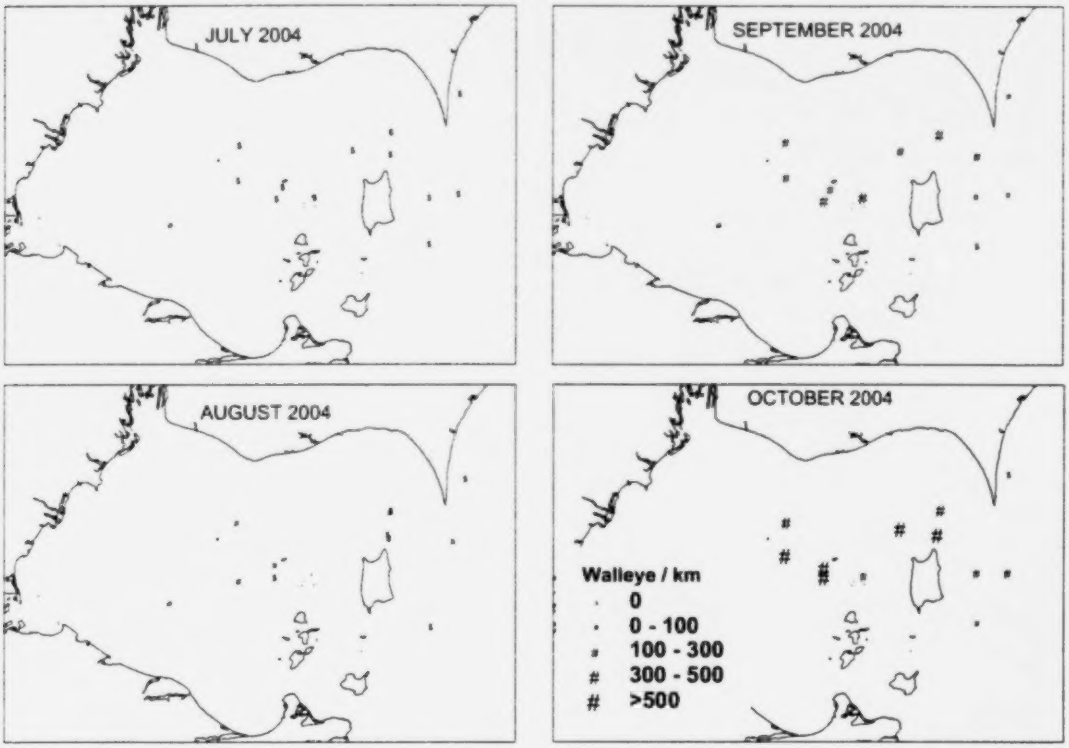
JULY 2004
SEPTEMBER 2004
AUGUST 2004
OCTOBER 2004
Walleye / km
0
0 - 100
100 - 300
300 - 500
>500

Figure 1. Catch rate of yearling walleye (number per km) in 57 mm commercial style gill nets (15 and 24 meshes deep pooled) from July to October, 2004.

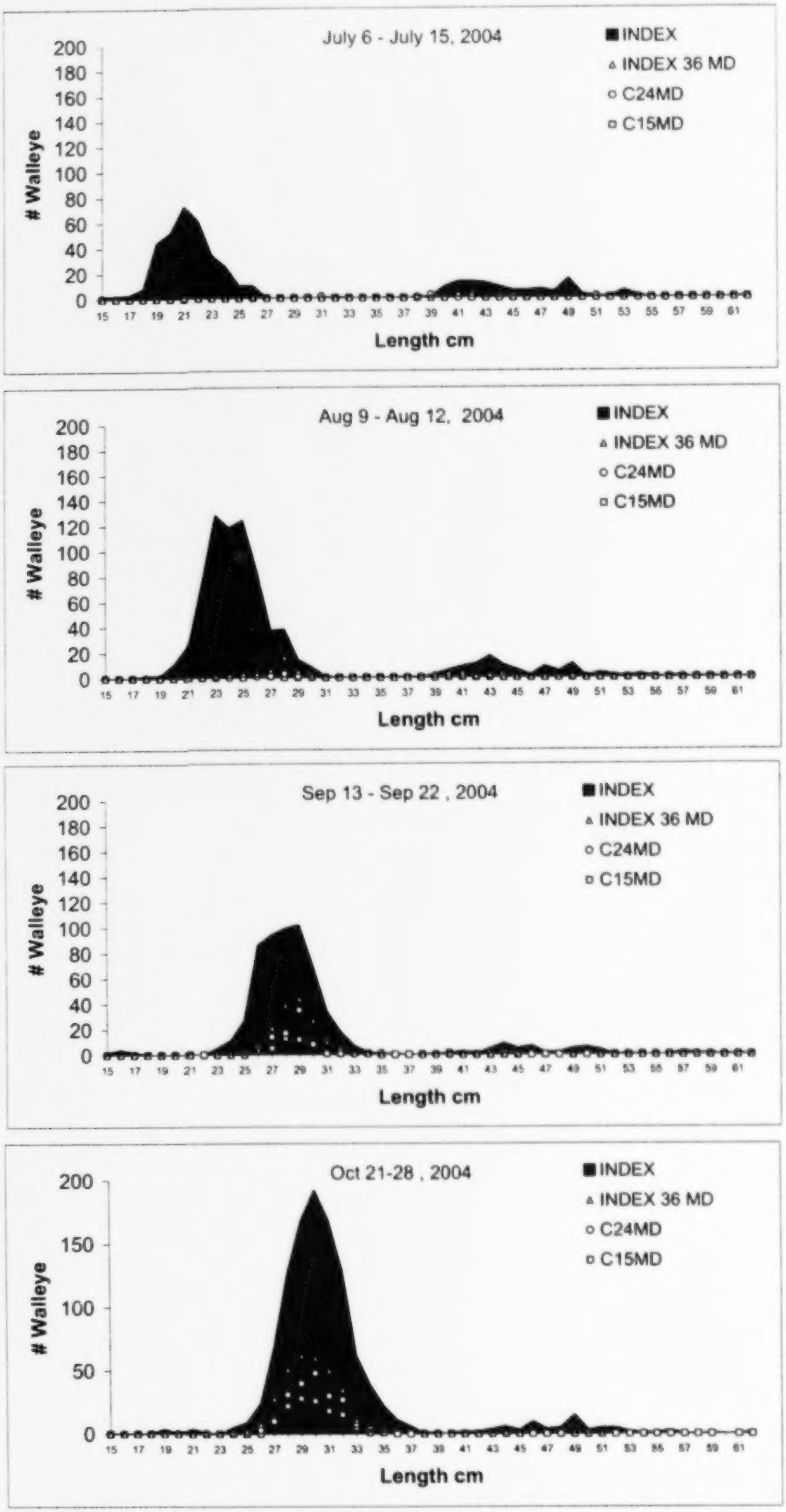

Figure 2. Walleye catch by 1 cm length interval in all index mesh sizes, 36 mesh deep 57 mm index, commercial style 15 and 24 mesh deep 57 mm gill nets. Index nets include 32 to 102 mm, adjusted for equal effort among mesh sizes. Yearling walleye study, 2004.

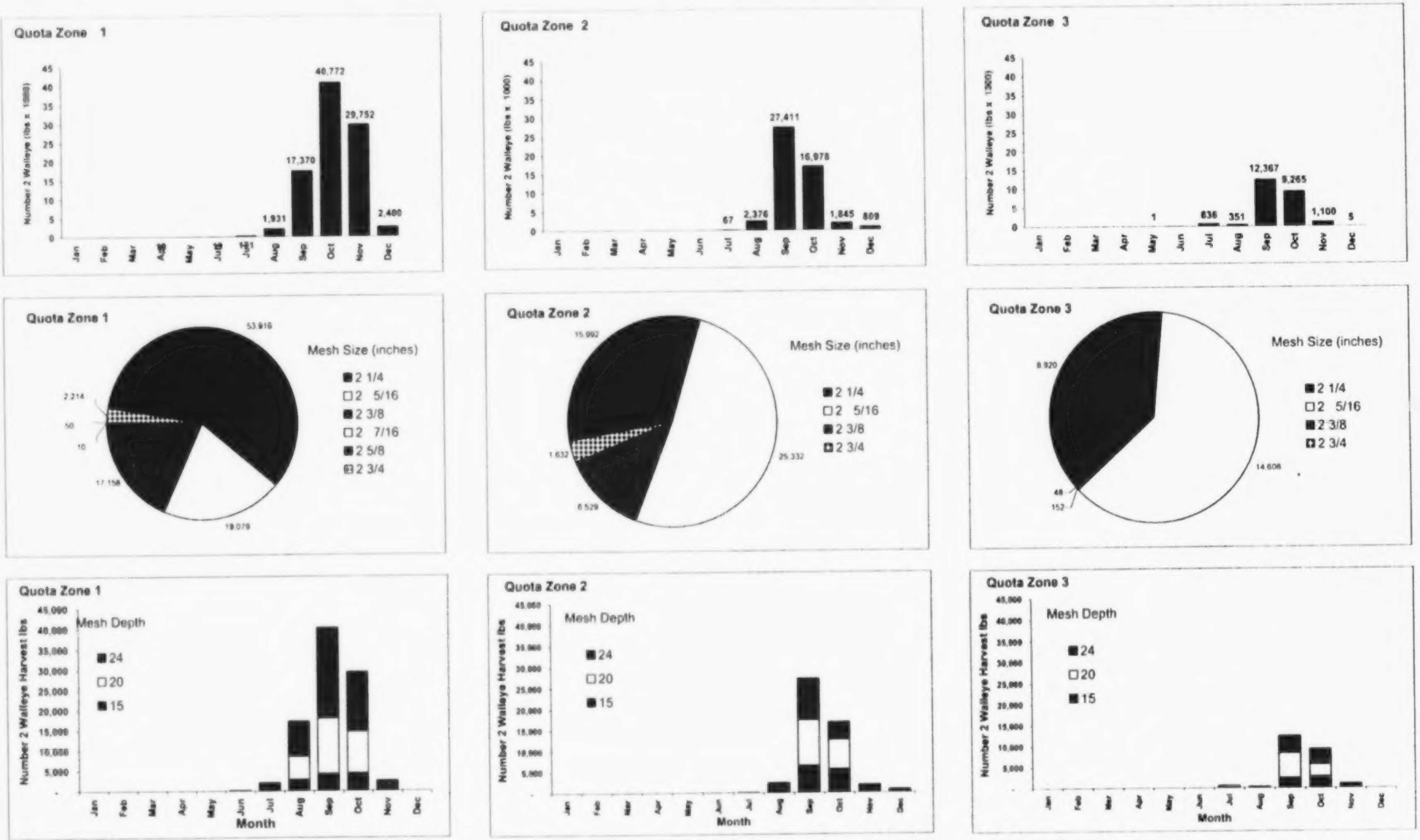

Figure 3. Monthly commercial gill net harvest of number 2 walleye (top row), annual harvest of number 2 walleye by mesh size (middle row) and monthly harvest of number 2 walleye by depth of gill net (number of meshes). Columns represent quota zones 1, 2 and 3 respectively. Mesh sizes less than 3 inches (76 mm) are included.

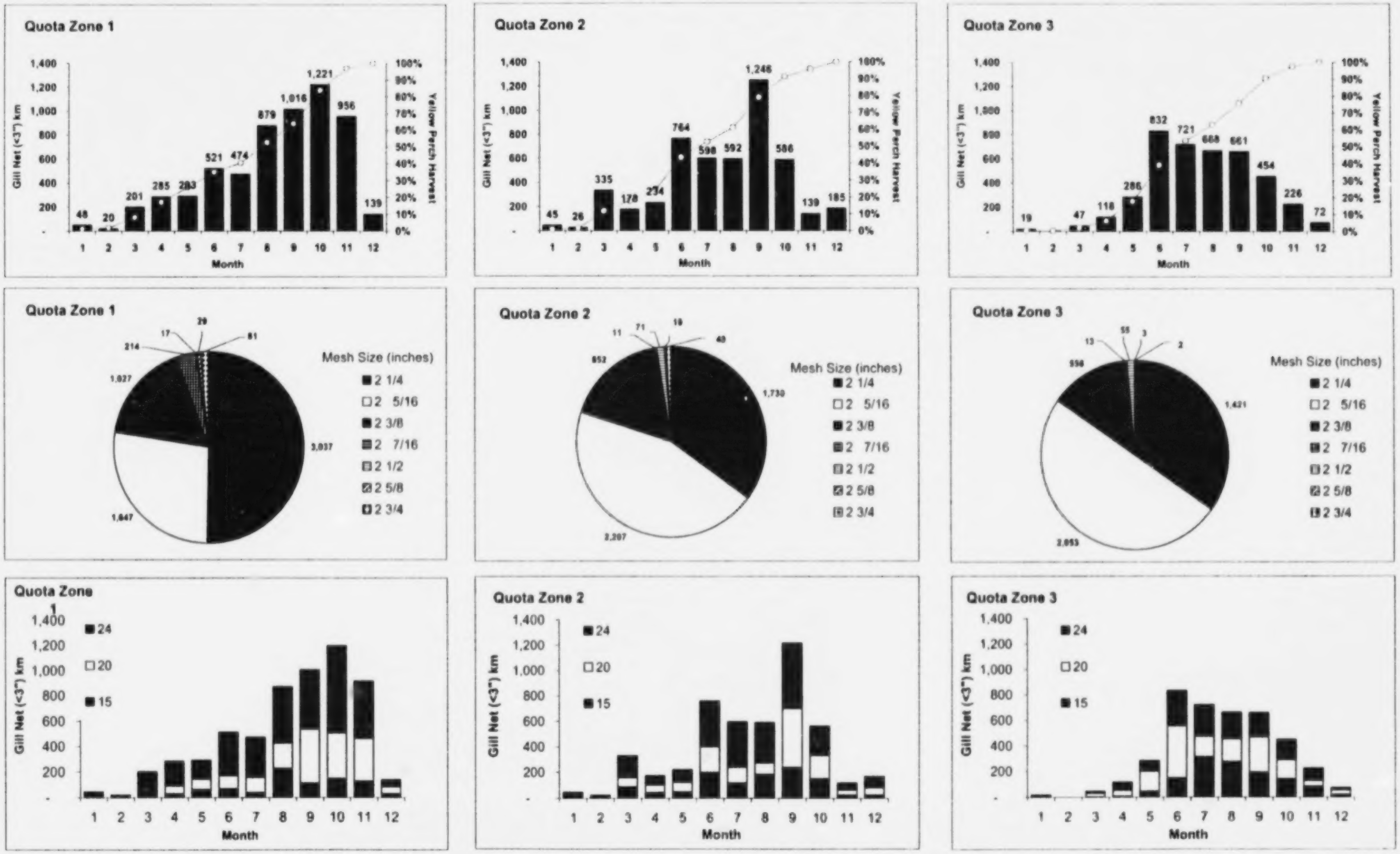

Figure 4. Monthly commercial gill net effort and cumulative yellow perch harvest % (top row), annual small mesh gill net effort by mesh size (middle row) and monthly effort by depth of gill net (number of meshes) (bottom row) by quota zone, 2004. Columns represent quota zones 1, 2 and 3 respectively. Only mesh sizes less than 3 inches (76 mm) are included in all figures.

Table 1. Walleye catch information collected during the yearling walleye study July - October 2004. Results are expressed as yearling walleye per net, all walleye per net, fraction of walleye caught that were yearlings, and yearling catch rates expressed per km, per m^2, per standardized commercial 24 mesh deep 2.25" (57 mm) net and in kg of yearling walleye per km.

Month	Gear	Yearlings Per Net	Walleye Per Net	% Yearlings	Yearlings Per km	Yearlings Per m^2	Yearlings Per Standard Net[1]	Yearlings (kg) Per km
July	C15 2.25"	0.0	0.3	0%	0.0	0.00	0.0	0
	C24 2.25"	0.0	0.5	0%	0.0	0.00	0.0	0
	C25-C24 Mean	0.0	0.4	0%	0.0	0.00	0.0	0
	INDEX 2.25"	0.2	0.8	22%	5.5	0.00	0.1	1
August	C15 2.25"	0.4	0.6	71%	11.4	0.02	0.7	2
	C24 2.25"	0.7	1.1	62%	18.2	0.02	0.7	3
	C25-C24 Mean	0.5	0.8	66%	14.8	0.02	0.7	2
	INDEX 2.25"	3.1	3.9	79%	101.2	0.06	2.4	17
September	C15 2.25"	4.3	4.4	98%	118.5	0.16	6.9	23
	C24 2.25"	7.9	8.1	98%	216.5	0.18	7.9	43
	C25-C24 Mean	6.1	6.3	98%	167.5	0.17	7.4	33
	INDEX 2.25"	12.7	12.8	99%	415.7	0.23	10.0	81
October	C15 2.25"	11.1	11.1	100%	303.2	0.41	17.7	68
	C24 2.25"	16.9	17.0	100%	462.7	0.39	16.9	104
	C25-C24 Mean	14.0	14.0	100%	382.9	0.40	17.3	86
	INDEX 2.25"	25.9	26.0	100%	850.6	0.47	20.5	185

[1] equals yearlings per m^2 multiplied by the area of commercial 24 mesh deep 2.25" nets (C24)

C15 = commercial style 2.25" (57mm) gill net 15 meshes deep (0.742 m)

C24 = commercial style 2.25" (57mm) gill net 24 meshes deep (1.188 m)

C25-C24 Mean is the average of the 15 and 24 mesh deep commercial style nets (C15+C24/2)

INDEX 2.25" (57mm) net is 36 meshes deep (1.8 m)

Table 2. Estimated commercial harvest of yearling walleye based on scenarios of yearling catch rates in 57 mm gill nets with net depths of 15 (top), 24 (middle) and an average of the 15 and 24 meshes (bottom) multiplied by reported gill net effort with mesh sizes less than 76 mm in quota zone 1.

	Study				Estimated Harvest*		Reported Harvest	
Month	Yearlings Per km	Yearlings (kg) Per km	Commercial Reported Effort km	Mean Weight (g)	Yearlings	Yearlings (kg)	Yearlings**	Yearlings (kg)
				15 Mesh Deep (C15)				
July	-	-	474	114	-	-	681	78
August	11	1.7	879	171	10,023	1,473	5,120	876
September	119	22.9	1,016	195	120,411	23,274	40,312	7,878
October	303	68.2	1,221	222	370,224	83,236	83,209	18,491
				Total	500,659	107,984	129,322	27,322
				24 Mesh Deep (C24)				
July	-	-	474	114	-	-	681	78
August	18	3.3	879	171	16,037	2,867	5,120	876
September	217	43.0	1,016	195	219,982	43,674	40,312	7,878
October	463	103.6	1,221	222	565,078	126,474	83,209	18,491
				Total	801,097	173,016	129,322	27,322
				C15-C24 Mean				
July	-	-	474	114	-	-	681	78
August	15	2.5	879	171	13,030	2,170	5,120	876
September	168	33.0	1,016	195	170,197	33,474	40,312	7,878
October	383	85.9	1,221	222	467,651	104,855	83,209	18,491
				Total	650,878	140,500	129,322	27,322

* Note estimates are based on study nets fished overnight whereas the commercial fishery was restricted to fishing during daylight hours only July to September, 2004.

** Numbers of yearling walleye reported in the harvest was determined using study mean weights from 57 mm gill nets.

Table 3. Differences between yearling walleye catch rates (number / km) in three configurations of 2.25" (57 mm) gillnet: 15, 24 and 36 meshes deep (C15, C24 and INDEX36) by month. Shapiro-Wilk test for normality, and tests for significant differences in catch rates between nets with different depths. The T test is applicable if normal assumption is true, otherwise the Sign test and Signed Rank tests are applicable.

			Ho: normal	Ho: Difference = 0			
Month	Gears	Mean Difference	Shapiro-Wilk P < W	T Test P>|t|	Sign P >=|M|	Signed Rank P >= |S|	Significantly Different? $\alpha_{0.05}$
July	C15-C24	0.0	n/a	n/a	n/a	n/a	NO
	C15-INDEX36	-5.5	<0.0001	0.1700	0.5000	0.5000	NO
	C24-INDEX36	-5.5	<0.0001	0.1661	0.5000	0.5000	NO
August	C15-C24	-6.8	0.2200	0.4300	0.4500	0.5900	NO
	C15-INDEX36	-89.8	0.0005	0.0600	0.1800	0.0200	YES
	C24-INDEX36	-83.0	<0.0001	0.0725	0.0070	0.0078	YES
September	C15-C24	-98.0	0.6800	0.0200	0.0200	0.0200	YES
	C15-INDEX36	-297.2	0.4800	0.0006	0.0010	0.0010	YES
	C24-INDEX36	-199.2	0.8116	0.0009	0.0117	0.0020	YES
October	C15-C24	-159.6	0.4100	0.0100	0.2300	0.0100	YES
	C15-INDEX36	-547.4	0.8988	<0.0001	0.0010	0.0010	YES
	C24-INDEX36	-387.9	0.7385	0.0005	0.0010	0.0010	YES

Table 4. Differences between yearling walleye catch rates (number / m^2) in three configurations of 2.25" (57 mm) gillnet: 15, 24 and 36 meshes deep (C15, C24 and INDEX36) by month. Shapiro-Wilk test for normality, and tests for significant differences in catch rates between nets with different depths. The T test is applicable if normal assumption is true, otherwise the Sign test and Signed Rank tests are applicable.

			Ho: normal	Ho: Difference = 0			
Month	Gears	Mean Difference	Shapiro-Wilk P < W	T Test P>|t|	Sign P >=|M|	Signed Rank P >= |S|	Significantly Different? $\alpha_{0.05}$
July	C15-C24	0.0000	n/a	n/a	n/a	n/a	NO
	C15-INDEX36	-0.0030	<0.0001	0.1661	0.5000	0.5000	NO
	C24-INDEX36	-0.0030	<0.0001	0.1661	0.5000	0.5000	NO
August	C15-C24	0.0000	0.0400	0.9991	0.4531	0.7969	NO
	C15-INDEX36	-0.0409	0.0015	0.1337	0.1797	0.1992	NO
	C24-INDEX36	-0.0409	<0.0001	0.1088	0.0078	0.0078	NO
September	C15-C24	-0.0225	0.5018	0.4947	1.0000	0.6377	NO
	C15-INDEX36	-0.0712	0.5692	0.0679	0.2266	0.0674	NO
	C24-INDEX36	-0.0487	0.3039	0.0787	0.2266	0.1475	NO
October	C15-C24	0.0191	0.2130	0.7191	1.0000	0.8311	NO
	C15-INDEX36	-0.0640	0.5971	0.2107	0.5488	0.1475	NO
	C24-INDEX36	-0.0830	0.979	0.0887	0.0654	0.0674	NO

Table 5. Differences between yellow perch catch rates (kg / km) in three configurations of 2.25" (57 mm) gillnet: 15, 24 and 36 meshes deep (C15, C24 and INDEX36) by month. Shapiro-Wilk test for normality, and tests for significant differences in catch rates between nets with different depths. The T test is applicable if normal assumption is true, otherwise the Sign test and Signed Rank tests are applicable.

			Ho: normal	Ho: Difference = 0			
Month	Gears	Mean Difference	Shapiro-Wilk P < W	T Test P>|t|	Sign P >=|M|	Signed Rank P >= |S|	Significantly Different? $\alpha_{0.05}$
July	C15-C24	-79.586	0.0449	0.0098	0.0063	0.0049	YES
	C15-INDEX36	-0.753	0.0387	0.0068	0.0063	0.0010	YES
	C24-INDEX36	4.261	0.6119	0.7742	0.7744	0.8501	NO
August	C15-C24	-37.402	0.0004	0.0409	0.0386	0.0024	YES
	C15-INDEX36	-33.964	0.8737	0.0498	0.1460	0.0522	YES
	C24-INDEX36	3.438	0.1050	0.8909	0.7744	0.7334	NO
September	C15-C24	-23.548	0.0159	0.2358	0.0386	0.0522	YES
	C15-INDEX36	-84.901	0.7318	0.0012	0.0063	0.0015	YES
	C24-INDEX36	-61.353	0.0048	0.0334	0.1460	0.0068	YES
October	C15-C24	-41.840	0.6418	0.0002	0.0063	0.0010	YES
	C15-INDEX36	-18.134	0.3011	0.0128	0.1460	0.0161	YES
	C24-INDEX36	23.706	0.7736	0.0079	0.0063	0.0068	YES

Table 6. Differences between yellow perch catch rates (g / m^2) in three configurations of 2.25" (57 mm) gillnet: 15, 24 and 36 meshes deep (C15, C24 and INDEX36) by month. Shapiro-Wilk test for normality, and tests for significant differences in catch rates between nets with different depths. The T test is applicable if normal assumption is true, otherwise the Sign test and Signed Rank tests are applicable.

			Ho: normal	Ho: Difference = 0			
Month	Gears	Mean Difference	Shapiro-Wilk P < W	T Test P>|t|	Sign P >=|M|	Signed Rank P >= |S|	Significantly Different? $\alpha_{0.05}$
July	C15-C24	-5.74	0.0148	0.7831	1.0000	0.9097	NO
	C15-INDEX36	54.06	0.0848	0.0191	0.0386	0.0161	YES
	C24-INDEX36	59.79	0.3736	0.0046	0.1460	0.0068	YES
August	C15-C24	5.32	0.0003	0.6266	0.0063	0.0342	YES
	C15-INDEX36	38.75	0.2132	0.0083	0.0386	0.0034	YES
	C24-INDEX36	33.43	0.0170	0.1111	0.3877	0.0771	NO
September	C15-C24	21.20	0.0003	0.3683	1.0000	0.8501	NO
	C15-INDEX36	17.06	0.1655	0.1893	0.7744	0.3804	NO
	C24-INDEX36	-4.14	0.0005	0.7658	0.7744	0.5186	NO
October	C15-C24	4.05	0.4509	0.6218	0.7744	0.7910	NO
	C15-INDEX36	51.41	0.2504	0.0065	0.0386	0.0049	YES
	C24-INDEX36	47.36	0.6027	0.0007	0.0063	0.0015	YES

Table 7. Walleye and yellow perch catch rates expressed as kg / km and by area (g / m^2) in 57 mm gill nets 15, 24 and 36 (index) meshes deep, July to October 2004. Hypothetical walleye catch (numbers) in each 57 mm gear relative to commercial nets 15 meshes deep was derived based on efficiency of each gear catching yellow perch and yearling walleye catch rates in that gear (see footnote).

		Yellow Perch		Walleye			
Month	Gear	kg / km	g / m^2	kg / km	number / km	g / m^2	Walleye Catch (numbers) Relative to C15 MD*
July	C15MD	121	163	0	0.0	0	n/a
	C24MD	201	169	0	0.0	0	n/a
	INDEX	196	109	1	5.5	0.3	n/a
August	C15MD	73	98	2	11.4	2	100%
	C24MD	110	93	3	18.2	3	106%
	INDEX	107	59	17	101.2	10	605%
September	C15MD	81	109	23	118.5	31	100%
	C24MD	105	88	43	216.5	36	142%
	INDEX	166	92	81	415.7	45	171%
October	C15MD	78	105	68	303.2	92	100%
	C24MD	119	101	104	462.7	87	99%
	INDEX	96	53	185	850.6	103	227%

* Relative walleye catch$_i$ = (Walleye Catch Rate$_i$ / Walleye Catch Rate$_{C15}$)*(Yellow Perch Catch Rate$_{C15}$ / Yellow Perch Catch Rate$_i$)
Walleye catch rate in number per km; yellow perch catch rate in kg / km.
More gill net effort is required to reach yellow perch quota if yellow perch catch rates are lower, affecting walleye catch.

Table 8. Hypothetical monthly catch (number and kg) of yearling walleye in 2.25" (57 mm) gill nets 15,24,36 meshes deep and an average of 15 and 24 mesh deep nets in quota zone 1 based on study data collected in 2000 and 2004, and reported commercial gill net effort (< 3" or 76mm) in 2000 and 2004. Estimated catch is based on overnight gill net sets in studies. In 2004, a commercial licence condition prohibiting overnight fishing July - September was in effect. In 2004, the study did not occur in November.

		2000					2004				
Month	Gear	Yearlings Per km	Yearlings kg/km	Reported Commercial Effort (<3" mm) (km)	Estimated Catch (Number of Yearlings)	Estimated Catch (kg of Yearlings)	Yearlings Per km	Yearlings kg/km	Reported Commercial Effort (<3" mm) (km)	Estimated Catch (Number of Yearlings)	Estimated Catch (kg of Yearlings)
July	C15 2.25"	2.3	0.3	793	1,809	233	0.0	-	474	-	-
	C24 2.25"	4.6	0.6	793	3,618	467	0.0	-	474	-	-
	C25-C24 Mean	3.4	0.4	793	2,713	350	0.0	-	474	-	-
	INDEX 2.25"	2.7	0.4	793	2,166	279	5.5	1	474	2,592	295
August	C15 2.25"	31.9	6.4	1,696	54,128	10,835	11.4	2	879	10,023	1,473
	C24 2.25"	50.2	10.0	1,696	85,069	17,029	18.2	3	879	16,037	2,867
	C25-C24 Mean	41.0	8.2	1,696	69,599	13,932	14.8	2	879	13,030	2,170
	INDEX 2.25"	93.0	18.6	1,696	157,738	31,576	101.2	17	879	88,995	15,358
September	C15 2.25"	31.9	8.0	1,071	34,190	8,598	118.5	23	1,016	120,411	23,274
	C24 2.25"	70.7	17.8	1,071	75,708	19,039	216.5	43	1,016	219,982	43,674
	C25-C24 Mean	51.3	12.9	1,071	54,949	13,819	167.5	33	1,016	170,197	33,474
	INDEX 2.25"	199.7	50.2	1,071	213,913	53,795	415.7	81	1,016	422,318	82,013
October	C15 2.25"	70.7	22.4	664	46,901	14,839	303.2	68	1,221	370,224	83,236
	C24 2.25"	70.7	22.4	664	46,901	14,839	462.7	104	1,221	565,078	126,474
	C25-C24 Mean	70.7	22.4	664	46,901	14,839	382.9	86	1,221	467,651	104,855
	INDEX 2.25"	106.7	33.7	664	70,797	22,399	850.6	185	1,221	1,038,738	226,362
November	C15 2.25"	11.4	4.1	106	1,213	434	n/a	n/a	956	n/a	n/a
	C24 2.25"	13.7	4.9	106	1,455	521	n/a	n/a	956	n/a	n/a
	C25-C24 Mean	12.5	4.5	106	1,334	478	n/a	n/a	956	n/a	n/a
	INDEX 2.25"	10.9	3.9	106	1,164	417	n/a	n/a	956	n/a	n/a
July - October (Total)	C15 2.25"			4,225	137,028	34,506			3,590	500,659	107,984
	C24 2.25"			4,225	211,296	51,374			3,590	801,097	173,016
	C25-C24 Mean			4,225	174,162	42,940			3,590	650,878	140,500
	INDEX 2.25"			4,225	444,613	108,050			3,590	1,552,644	324,028

C15 = commercial style 2.25" gill net 15 meshes deep (0.742 m)
C24 = commercial style 2.25" gill net 24 meshes deep (1.188 m)
C25-C24 Mean is the average of the 15 and 24 mesh deep commercial style nets (C15+C24)/2
INDEX 2.25" net is 36 meshes deep (1.8 m)

Lake Erie Fisheries Assessment Unit Report 2006-1

Lake Erie Western Basin Access Creel Survey, 2005

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In Partnership with the Ontario Federation of Anglers and Hunters

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Introduction

For over 50 years, the Ontario Ministry of Natural Resources (OMNR) has conducted creel surveys on various parts of Lake Erie and its tributaries (Sztramko and Paine, 1984). The last lake-wide survey of Lake Erie was an aerial creel survey, where boat activity counts were measured from aerial observations. Along with the aerial survey, complete-trip creel interviews were performed at access points. This creel survey sampled June 1–August 31, 1998 (Sztramko, 2000) and was completed in partnership with the Ontario Federation of Anglers and Hunters (OFAH).

Access point creel surveys were completed (again in partnership with OFAH) in 2003 and 2004 to learn about the quality and estimate harvest in the Ontario recreational fishery in Lake Erie. During the access point creel surveys, creel clerks conducted complete-trip interviews with anglers. The 2003 access creel survey reported on the summer sport fisheries' harvest and angler effort in the eastern basin of Lake Erie (Arnold et al. 2004). The following year, the 2004 access creel survey reported on summer angling effort and harvest in the central basin of the lake (MacDougall et al. 2005).

This document describes the access creel survey completed in 2005 in western Lake Erie. This survey was carried out to satisfy the following objectives:

1. To measure the catch, harvest, and effort of anglers for several species in western Lake Erie: walleye (*Sander vitreus*), yellow perch (*Perca flavescens*), rainbow trout (*Salmo gairdneri*), and smallmouth bass (*Micropterus dolomieu*).
2. To describe angler effort and success rates for both shore-based and boating anglers for the entire basin.
3. To collect biological data for target fish species that were harvested by anglers (length, weight, age and diet).
4. To collect the opinions of anglers regarding potential changes to the sport fishing regulations using an angler attitude survey.

Completion of the 2005 access creel survey has added information on the western basin of Lake Erie to the summer sport fisheries data now available from the other two basins of the lake. Summer sport fishery data from all three lake basins are now available and can be used to inform fisheries management decisions. Sport fisheries in Lake Erie have not been measured for the whole lake on an annual basis by Ontario, however, the completion of access creel surveys such as the 2003–2005 series provide estimates of sport fishery catch and harvest that can help estimate the magnitude of fisheries and determine harvest levels that can ultimately be used when setting international total allowable catch and jurisdictional fisheries quota levels.

Methods

Survey area

The study area for the 2005 access creel survey covered the Canadian portion of the western basin of Lake Erie. Typically, Lake Erie's western basin eastern boundary is the southernmost point of Point Pelee (e.g. Ryan et al. 2003). The three access points visited during the creel survey were Colchester Harbour, Cedar Island Municipal Marina (in Kingsville) and Leamington Municipal Marina. Although not part of the western basin by definition, one additional access point, Wheatley Harbour, was also sampled (Figure 1). Samples at Wheatley Harbour were collected so that interannual comparisons between landings in 2004 and 2005 could be made for the access point.

Survey design

This creel census operated between June 7 and September 2, 2005. The survey design was stratified by: season (June, July, and August), day type (weekday or weekend), census shift (morning or afternoon), and location (access point).

The survey team consisted of two crews, each with two clerks. Each crew covered one shift (6 hours) per scheduled day. Two census shifts were available for sampling each day, either the morning shift (08:00–14:00) or the afternoon shift (14:00–20:00). Both crews were scheduled to work a total of nine shifts each week (6 weekday and 3 weekend) from the 14 potential shifts (10 weekday and 4 weekend) in the week. Weekday and weekend shifts were randomly selected without replacement, so that only one crew worked per each census shift each day (Appendix 1).

Each access point had a single boat ramp, which was monitored for the duration of each census shift. The activity at the boat ramp was observed and recorded by the creel clerks. Boats were classified as either fishing or recreational. Shore angling activity was also observed and recorded by creel clerks. Hourly tallies of fishing boat activity and shore angling were recorded on the separate copies of the OMNR Creel Log Form No. 951 (84/03) (Appendix 2.1). In addition to activity observations, clerks conducted interviews with both boating and shore-based anglers. Anglers were only interviewed if they were finished fishing for the day. Interview data were recorded on the OMNR Creel Interview Form No. 948 (84/03) (Appendix 2.2). Boating anglers were interviewed at or near the boat ramp as boats were being removed from the water or being prepared for transport. Shore anglers were interviewed along the main pier at each site.

Whenever possible, biological samples were collected from the landed harvest of anglers. Total length and round weight were measured for salmonids, smallmouth bass, yellow perch, and walleye. Scale and stomach samples were also collected for salmonids, yellow perch, and walleye. Stomach samples were preserved in 70% isopropyl alcohol and returned to the laboratory for processing. Clerks also recorded the responses of anglers who volunteered to participate in a survey regarding proposed regulation changes in Lake Erie. These responses were recorded on a form specific to the Angler attitude survey.

Data were entered and analysed with FISHNET version 2.0, (Lester et al. 1989). Two-stage estimation techniques were used to get estimates of catch, harvest, and effort: first daily estimates of catch, harvest, and effort are generated, then the mean daily estimates are calculated and multiplied by stratum size (i.e. the number of days) to estimate totals for each stratum (Lester and Korver, 1996). Formulae for the two-stage estimation process in FISHNET are found in Appendix 3.

Catch rates for individual species were calculated by two different methods. Catch per unit effort (CUE) was determined for both target anglers and for all anglers. For the CUE of target anglers, only the observed catch and observed effort data for anglers who targeted an individual species were included in the calculation. For the CUE of all anglers, the catch and effort data of all anglers was included in the calculation.

Results

Western basin

Distribution of angling effort

Anglers spent an estimated 63,364 ± 6% relative standard error (RSE) rod-hours fishing in western Lake Erie from June 7 to September 2, 2005. Anglers used an average of 1.1 rods each. Each angling party had an average of 2.2 anglers. Most of the angling (99.7%) took place in the Canadian waters of Lake Erie.

The monthly angling effort estimate for July was the highest (45.0%). Angling effort applied in June (31.0%) and August (24.0%) was lower. Weekends had higher angling effort estimates (53.7%) than weekdays (46.3%). Afternoon (14:00–20:00) angling effort estimates were higher (51.8%) than the morning (08:00–14:00) angling effort estimates (48.2%).

Leamington Municipal Marina had the highest concentration of combined (i.e. both boat and shore) angling effort exerted this summer (38.5%). Cedar Island Municipal Marina in Kingsville (31.5%) was the second most popular access point with anglers. Colchester Harbour (30.0%) had a slightly lower summer combined angling effort estimate.

Anglers using boats applied more of the total estimated angling effort within the western basin this summer (80.1%) than shore anglers (19.9%). When the boat fishery is examined alone, more angling effort was applied by boaters using Leamington Municipal Marina (48.0%) than by Colchester Harbour (33.0%), or Cedar Island Municipal Marina (19.0%) (Figure 2). Shore angling effort was concentrated at Cedar Island Municipal Marina (81.9%); effort applied by shore anglers at Colchester Harbour was much lower in comparison (18.0%) and Leamington Municipal Marina (where shore angling at the marina is prohibited) had only one angler observed during the entire summer.

Catch, harvest, and catch-per-unit-effort estimates

Between June 7 and September 2, 2005, an estimated total of 95,921 fishes were caught (Table 1). Walleye was estimated to have the largest catch (30,083 ± 9% RSE). Estimated landings of walleye made up 31.5% of the basin total. Estimated catch of yellow perch (20,088 ± 16% RSE) was the next largest catch of a single fish species (20.9%). Freshwater drum (17.1% of the total catch), white perch (14.1%), and white bass (9.2%) were also caught often by anglers.

An estimated 48,581 fishes (50.6%) were harvested from the estimated western basin total catch (Table 1). The walleye harvest estimate (26,650 ± 9% RSE) was the largest component of the basin harvest (54.9%). Estimated yellow perch harvest was the second highest among all fishes (17266 ± 17% RSE), as it made up 35.5% of the entire basin harvest. White perch (4.8%) and white bass (1.9%) were also harvested by western basin anglers.

Walleye

July catch estimates of walleye were 45.8% of the total catch. Of the remaining total catch, more fish were caught in June (35.4%) than August (18.7%). Walleye were caught most often by anglers using Leamington Municipal Marina (43.6%). Anglers launching from Colchester Harbour caught another 37.8% of the total catch. Walleye were also caught at Cedar Island Municipal Marina (19.2%).

Estimated walleye harvest was the greatest among all fish species in the creel survey. Walleye harvest peaked in July (47.4%). Anglers harvested 32.6% of the total estimated harvest in June and harvested an additional 19.9% in August. Estimated harvest was divided among the access points in the same manner that total catch was partitioned (Table 2).

The observed CUE for walleye across the western basin was 0.6 fish per rod-hour. Anglers that specifically targeted walleye had a CUE of 0.8 fish per rod-hour. Catch rates of walleye decreased across the creel survey months: June had a CUE of 0.7 fish per rod-hour, July's observed CUE was 0.6 fish per rod-hour, and August had a CUE of 0.4 fish per rod-hour. No observations of shore anglers catching walleye exist for the length of the creel survey.

Leamington Municipal Marina, Colchester Harbour, and Cedar Island Municipal Marina all had similar CUEs for walleye (Figure 4). The CUE for only anglers targeting walleye was highest at Leamington Municipal Marina (0.8 fish/rod-hour). Cedar Island Municipal Marina and Colchester Harbour had similar catch rates for anglers actively targeting walleye (0.7 fish/rod-hour).

Yellow perch

The total estimated catch of yellow perch peaked in June (43.7%), decreased in July (20.3%), and recovered slightly in August (36.1%). The majority of yellow perch were caught by anglers using the Leamington Municipal Marina access point (75.3%, Table 3). Anglers at both Colchester Harbour (16.5%) and Cedar Island Municipal Marina (8.1%) also caught yellow perch..

Yellow perch monthly harvest estimates and monthly catch estimates fluctuated in the same manner: June harvest estimates were the greatest (41.1%), followed by August (39.6%), and July (19.2%). The distribution of yellow perch harvest among access points was similar to the distribution of the catch: Leamington Municipal Marina anglers had the greatest total estimated harvest of yellow perch (76.0%). Colchester Harbour (15.7%) and Cedar Island Municipal Marina (8.3%) anglers had harvest estimates that corresponded to catch estimates.

The observed yellow perch CUE for the entire survey period was 0.4 fish per rod-hour. The yellow perch target CUE for the survey period was 2.0 fish per rod-hour, the highest CUE for any fish species. June had the highest monthly CUE (0.6 fish/rod-hour). The observed catch rate of yellow perch of boat anglers during the duration of the creel survey (0.4 fish/rod-hour) was higher than the observed catch rate of shore anglers (0.003 fish/rod-hour).

Leamington Municipal Marina had the highest observed CUE for yellow perch among all of the access points (0.6 fish/rod-hour, Figure 4) and the highest yellow perch target CUE (2.5 fish/rod-hour). Observed catch rates of yellow perch at Cedar Island Municipal Marina and Colchester Harbour were effectively 0.2 fish per rod-hour of all anglers. The CUE of anglers who targeted yellow perch at Colchester Harbour (1.1 fish/rod-hour) and Cedar Island Marina (0.8 fish/rod-hour) were less than half of the observed catch rates at the two other access points.

Smallmouth bass

The smallmouth bass made up a small component of western Lake Erie fishery, with only 1.9% of the total catch and 0.6% of the total harvest. An estimated 1809 ± 20% RSE smallmouth bass were caught in western Lake Erie during the period of the creel survey. Smallmouth bass catches were ample in June (36.9%), peaked in July (46.9%), and decreased in August (16.1%). The major portion of the smallmouth bass catch was reported at Leamington Municipal Marina (64.1%, Table 4). Smallmouth bass catches were also reported at Colchester Harbour (25.2%) and Cedar Island Municipal Marina (10.7%).

Approximately 17% of the smallmouth bass caught were harvested. Monthly harvest estimates follow the same trend as monthly catch estimates for smallmouth bass: there was an increase in harvest until the peak in July (41.6%), followed by a slight decline in August (18.5%). Anglers using Colchester Harbour had the largest estimated harvest in western Lake Erie (56.8%), followed by the harvest at Leamington Municipal Marina (39.9%) and Cedar Island Municipal Marina (3.2%).

The observed catch rate for smallmouth bass across the entire period of the survey was low in comparison to the other popular sport fish species (0.02 fish/rod-hour). For only those anglers who targeted smallmouth bass, the observed CUE was 0.5 fish per rod-hour (Table 1). The highest monthly CUE was observed in June (0.03 fish/rod-hour for all anglers, 1.3 fish/rod-hour for target anglers). Monthly CUEs decreased during the course of the survey.

Smallmouth bass were targeted by both boating anglers and shore anglers, although only shore anglers from only Colchester Harbour were observed to catch any smallmouth bass. The CUE for boat anglers who targeted smallmouth bass was higher (0.5 fish/rod-hour) than those angling from shore (0.4 fish/rod-hour).

Leamington Municipal Marina had the highest smallmouth bass catch rate (0.04 fish/rod-hour) among the access points (Figure 5). The Colchester Harbour smallmouth bass CUE was half that of Leamington Marina, and Cedar Island Municipal Marina CUE was 75% lower. When only considering anglers who targeted smallmouth bass, the differences between access points were not the same: Leamington Marina still had the highest CUE (0.5 fish/rod-hour) but Colchester Harbour and Cedar Island Municipal Marina had the same CUE for anglers who targeted smallmouth bass (0.4 fish/rod-hour).

Biological characteristics of harvest

Over the course of the survey, 253 fishes were sampled. Most samples (200) were collected from walleye. There were also 52 yellow perch and one smallmouth bass (330 mm TL, undetermined age) sampled. All samples were obtained from anglers using boats.

There were 60 stomach samples obtained during the survey. Most samples were obtained from walleye (49). There were also 11 yellow perch stomachs collected. All samples were obtained from anglers using boats.

Walleye

Walleye caught by anglers ranged in age from 2 to 10 years old, with the modal age (77.7%) of 2 years old (Figure 6). The second largest contribution (11.2%) from one year-class was from fish that were 4+ years in age. The oldest walleye (age–10) was sampled at Leamington Municipal Marina. When grouped by access point of collection, all western basin access points displayed the same age composition for walleye, where the age-2 year class was dominant (Appendix 4.1).

The distribution of total length (TL) for walleye was skewed to the right, with most walleye ranging in length from 301–350 mm TL (46.2%) and 351–400 mm TL (29.4%, Figure 6). The geometric mean length was 375 mm TL and the geometric mean weight was 426 grams. The longest walleye sampled (675 mm TL) was from Leamington Municipal Marina. In concordance with walleye age distribution, the western basin length distribution was mimicked by length compositions for each access point (Appendix 4.2).

Of the 49 walleye stomachs collected for diet analysis, 24 were empty. Of the non-empty walleye stomachs, 60% contained gizzard shad, white perch, shiners (*Notropis* species), and other unidentified fishes; 48% contained aquatic invertebrates (Ephemeropteran nymphs); and 8% contained insect parts such as earthworms and unidentified insect wings. As earthworms were used by many anglers during the summer as bait for walleye, the presence of them in walleye stomach samples was anticipated. White perch and gizzard shad were the largest prey items ingested by the walleye sampled (Table 5).

Yellow perch

Yellow perch ranged in age from 2 to 8 years old, with a modal age (38.0%) of 4 years old (Figure 7). A further 20.0% of the yellow perch sampled were age–6. The three age–8 fish were sampled at both Cedar Island Municipal Marina (1 fish) and Colchester Harbour (2 fish). Among the yellow perch age distributions for each access point, Colchester Harbour (n = 12) had a bimodal distribution (age–4 and age–6 were equally abundant) while Leamington Municipal Marina and Cedar Island Municipal Marina had unimodal distributions, both with a modal age of 4 years old. (Appendix 4.3).

Yellow perch that were between 201–250 mm in total length were the predominant size class (50.0%) in the western basin (Figure 7). The size class with the second highest number of members was 251–300 mm TL (32.0%). The geometric mean length of yellow perch was 243 mm TL. The geometric mean weight of sampled yellow perch was 166 grams. The longest yellow perch sampled (336 mm TL) was from Leamington Municipal Marina. When the size distributions for individual access points were compared to each other, Colchester Harbour was the only access point where the 251–300 mm TL size class dominated (58.3%) the distribution rather than the 201–251 mm TL size class (Appendix 4.4).

Seven of the 11 yellow perch stomachs collected for diet analysis were empty. Non-empty stomachs contained fishes (57.1%) and Dreissinid mussels (42.8%). Gizzard shad was the only fish species identified in the yellow perch stomach samples (Table 5).

Angler profile

During the creel survey interview process, anglers answered questions regarding their fishing methods, place of origin, and accommodations. Anglers using boats most often trolled (81.4%, Table 6) or were still-fishing (7.1%). Shore anglers employed still-fishing most often (86.4%) or used a combination of methods when fishing (11.5%).

The majority of angling parties were from the local area (90.8%). The second largest group of anglers originated in the United States of America (5.2%). A small portion of anglers were residents of Ontario, but resided outside of the local area (2.7%). Those anglers who were non-residents most often made day-trips to fish western Lake Erie (7%).

Comparisons to other surveys

The results of the 2005 western basin access creel survey were compared to results of previous creel surveys in Lake Erie. The most recent creel surveys that included the western basin in their sample areas were aerial creel surveys conducted in 1998 (Sztramko, 2000) and from 1990 to 1992 (Sztramko 1991, 1992, 1995). The design of the aerial creel surveys was slightly different from the 2005 access creel survey and the differences required some additional arrangements of the 2005 survey data. The aerial surveys covered the entire lake, access point data were grouped within each basin, and shore angling was not measured, while the 2005 survey only examined the western basin, data were summarised as access points, and shore angling estimates were calculated. In order to compare among surveys, the 2005 access point data were pooled to create estimates that reflected the entire western basin.

As shore angling was not recorded for any of the aerial creel surveys, shore effort is not included in any of the 2005 angling effort estimates presented unless stated. Total angling effort was estimated to be much lower in 2005 than in the previous creel surveys. The 2005 total angling effort estimate was 55.7% less than the 1992 angling effort estimate, which itself was the smallest estimate from the aerial creel surveys (Table 7). Even with the inclusion of the shore angling effort, the 2005 total angling effort estimate is 44.7% lower than the lowest estimate obtained from the 1990-1992 and 1998 creel surveys (Figure 9).

The estimates of effort, catch, and harvest and the observed CUEs for the major sport fisheries have varied across surveys but only the yellow perch fishery has a discernible pattern, where the trend was an increased CUE over time. Walleye and smallmouth bass CUEs both fluctuated over time.

Walleye

There was variation in the estimated proportion of total angling effort directed at walleye between 1990 and 2005. The aerial creel surveys (1990–1992, 1998) indicated that walleye was the main target species of the western basin sport fishery (mean value of 81.0% ± 9% RSE rod-hours). The 2005 estimated proportion of angling effort devoted to walleye was 72.1%, which was slightly less (3%) than the estimate from 1998 (Figure 10).

The total estimated angling effort directed at walleye decreased during the last three years of the aerial creel surveys, and the 2005 estimate followed the trend. The 2005 access point creel estimate of total angling effort devoted to walleye was 64.9% less than the mean aerial creel survey estimate (mean value of 104,234 ± 12% RSE rod-hours) and 64.3% less than the 1998 estimate. The 2005 estimate of total angling effort devoted to walleye was approximately half of the 1990 estimate, which was the lowest walleye effort estimate obtained from the aerial creel surveys.

While angler effort tended to decrease over time, the CUE for walleye anglers in western Lake Erie increased over the course of the final two aerial creel surveys (Figure 10). The 1998 walleye angler CUE was 31.5% higher than the 1992 walleye angler CUE. The 2005 CUE for walleye anglers followed the increasing trend as well: the 2005 estimate was 54.8% higher than the walleye angler CUE observed in the 1998 aerial creel survey.

Yellow perch

The proportion of total angling effort in western Lake Erie devoted to yellow perch has fluctuated over time. Estimates obtained from the aerial creel surveys between 1990 and 1998 indicated that yellow perch angling effort was 1% or less of the total angling effort exerted in the basin every year except 1990, when the estimated yellow perch angling effort was 14.1% of total angling effort (Figure 9). In 2005, yellow perch angling effort was estimated to be 14.8% of the total angling effort for the western basin, a substantial increase (99.2%) over 1998, when 0.13% of all angling effort was targeted at yellow perch (Figure 9).

The total yellow perch angling effort estimate for 2005 was larger than the previous three estimates from the aerial creel survey (1991, 1992, and 1998) but less than the estimate obtained from the 1990 aerial creel survey.. The estimated number of rod-hours devoted to yellow perch angling in 2005 was 97.9% larger than the 1998 estimate .(Figure 11). Observed catch rate for yellow perch anglers increased over the course of the aerial creel surveys, and this trend was continued in 2005. The observed CUE for yellow perch in 2005 was 39.6% higher than the 1998 CUE for yellow perch anglers.

Smallmouth bass

The proportion of total angling effort directed at smallmouth bass in western Lake Erie was more stable over time and larger than yellow perch angling effort. The mean annual angling effort for the all aerial creel surveys was 8.2% ± 39% RSE rod-hours. The proportion of angling effort devoted to smallmouth bass in 2005 was 5.2%, which was a smaller proportion than obtained for every aerial creel estimate, except 1991 (Figure 9).

There was a substantial difference between the total number of rod-hours estimated to have been spent on smallmouth bass angling in 2005 and in 1998. The 2005 estimate was 88.1% lower than the 1998 aerial creel estimate, and lower than all estimates from the previous aerial creel surveys (Figure 12). Catch rates between 1998 and 2005 did not follow the same trend as the smallmouth bass targeted angling effort: the CUE for smallmouth bass anglers in 2005 was 15.4% higher than the 1998 CUE for smallmouth bass anglers. Smallmouth bass CUEs have increased over the last three creel surveys (1992, 1998, and 2005) but the 2005 catch rate is still 33.9% lower than the highest smallmouth bass CUE recorded in the aerial creel survey of 1990.

Wheatley Harbour

Distribution of angling effort

An estimated 36,195 ± 7% RSE rod-hours of angling effort was applied in Lake Erie by anglers using Wheatley Harbour during June 7 to September 2, 2005 (Table 8). Fishing parties had an average of 2.4 anglers. The average number of rods used was 1.2 rods per angler. Most anglers (99.7%) fishing from Wheatley Harbour fished in Canadian waters.

Angling effort at Wheatley Harbour was highest in August (47.8%), when anglers exerted an estimated 17,310 ± 12% RSE rod-hours. The angling effort estimate for July (45.5% of total Wheatley angling effort, an estimate of 16,483 ± 9% RSE rod-hours) was almost as high as that of August. Angling effort applied in June was 6.6% of the access point total for Wheatley Harbour.

More anglers used the Wheatley Harbour access point on weekends (57.1%) than weekdays (42.9%). Anglers used the Wheatley Harbour access point more often in the morning (52.2%) than in the afternoon (47.8%). The majority of angling activity at Wheatley Harbour was done from boats (63.0%). Estimated angling effort applied by boat anglers was 22,786 ± 7% RSE rod-hours. Shore anglers were estimated to have exerted an additional 13,409 ± 14% RSE rod-hours.

Catch, harvest, and catch-per-unit-effort estimates

An estimated 42,507 fishes were caught by anglers using the Wheatley Harbour access point (Table 8). Wheatley anglers harvested 36.3% of their total catch (15,438 fishes). Yellow perch was the fish species most often caught (65.8%) and harvested (52.9%). Rainbow trout was the second most caught (14.7%) and harvested (35.6%) fish species. Freshwater drum (14.7%) and walleye (4.0%) were also caught by anglers using Wheatley Harbour, yet freshwater drum harvest (1.8%) was much less than the walleye harvest (9.3%).

Yellow perch

There were an estimated 27,950 ± 49% RSE yellow perch caught by anglers using the Wheatley Harbour access point during June 7 to September 2, 2005. Yellow perch landings increased across the months of June, July, and August, with 83.7% of the total yellow perch catch landed in August. Of the total catch of yellow perch, an estimated 29.1% was harvested by anglers. Distribution of yellow perch harvest across the months of June, July and August had the same pattern as the distribution of catch across the survey months: harvest increased across months, culminating in August (89.7%, Table 9).

Shore anglers applied almost all (99.7%) of the angling pressure on yellow perch at Wheatley Harbour. Catch and harvest of yellow perch was also dominated by shore anglers. Shore anglers were estimated to have caught 99.7% of the total yellow perch catch at Wheatley Harbour. While shore anglers were estimated to have harvested 8,159 ± 39% RSE yellow perch from June 7 to September 2, 2005, there were no yellow perch harvest observations from boat anglers during the length of the survey

The catch per unit effort of yellow perch at Wheatley Harbour was 0.2 fish per rod-hour for all anglers. Anglers that targeted yellow perch had a CUE of 2.4 fish per rod-hour. Monthly CUEs for yellow perch at Wheatley Harbour peaked in August for both target anglers (4.3 fish/rod-hour) and all anglers (0.3 fish/rod-hour). Catch rates for all anglers were low in June (0.03 fish/rod-hour) and July (0.08 fish/rod-hour) but CUEs for target anglers were considerable higher (June: 0.6 fish/rod-hour; July: 1.3 fish/rod-hour).

Rainbow trout and other salmonids

Anglers at Wheatley Harbour caught an estimated 6,242 ± 11% RSE rainbow trout from June 7 through to September 2, 2005. The monthly catch estimates for rainbow trout increased from the lowest estimate in June (3.6%) to the highest estimate in August (56.2%, Table 10). Estimates of rainbow trout harvest followed the same increasing trend across the survey months, with an estimated 3,181 ±16% RSE rainbow trout harvested in August, which represented 57.9% of the total harvest.

The observed catch rate for rainbow trout (taking all anglers into account) was 0.1 fish per rod-hour. For anglers targeting rainbow trout specifically, the CUE was 0.3 fish per rod-hour. August had the highest observed catch rate for rainbow trout (0.1 fish/rod-hour). Anglers who actively targeted rainbow trout during August had an observed catch rate of 0.4 fish per rod-hour.

The catch and harvest of other salmonids in addition to rainbow trout at Wheatley Harbour was limited to brown trout and Chinook salmon. The estimated catch and harvest of salmonids other than rainbow trout at Wheatley Harbour was low (0.1% of total catch, 0.2% of total harvest).

Walleye

Walleye catch at Wheatley Harbour from June 7 to September 2, 2005 was estimated to be 1,718 ± 13% RSE fish (Table 11). Catch increased across the months of June, July, and August. August catch estimates were 56.7% of the total Wheatley Harbour walleye catch. Of the walleye caught by anglers using Wheatley Harbour, 83.4% were harvested. The distribution of the total walleye harvest across the survey months is the same as the distribution of walleye catch: estimates of monthly harvest increase across months and peak in August, when 52.6% of the harvest was bought in by Wheatley anglers.

Walleye were only caught and targeted by boat anglers. The walleye catch rate of all boat anglers was 0.06 fish per rod-hour for June 7 to September 2, 2005. Anglers who actively targeted walleye had a CUE of 0.1 fish per rod-hour. Both the CUE for all anglers and the CUE for target anglers increased across the months of June, July and August, with maximum values of 0.09 fish per rod-hour and 0.2 fish per rod-hour for all anglers and target anglers, respectively.

Biological characteristics of harvest

There were 102 fishes sampled from Wheatley Harbour. Most samples (72) were obtained from rainbow trout. Also sampled at Wheatley were: walleye (23 samples), yellow perch (5 samples), Chinook salmon (1 sample), and brown trout (1 sample).

There were 46 stomach samples obtained at Wheatley Harbour from June 7 to September 2, 2005. Most samples were obtained from rainbow trout (32). The stomachs of ten walleye, three yellow perch and one Chinook salmon were also collected. Again, yellow perch stomach samples were obtained from shore anglers.

Yellow perch

All yellow perch collected at Wheatley Harbour were obtained from shore anglers. The yellow perch sampled (n = 5) were all determined to be 2 years old. The mean total length for the yellow perch was 185 mm TL and the mean weight was 80 grams. The largest yellow perch was 202 mm TL in length and weighed 100 grams. All three yellow perch stomach samples collected contained fishes. Two samples had fishes that could not be identified and third sample contained a fish that was identified as a shiner (*Notropis* sp., Table 12).

Rainbow trout and other salmonids

The Chinook salmon that was sampled had a total length of 731 mm, weighed 4,500 grams, and was estimated to be 2 years old. The brown trout that was sampled had a total length of 630 mm, weighed 4,500 grams, and had an age estimate of 3 years old. The stomach sample of the Chinook salmon was empty (Table 12).

Of the rainbow trout that were sampled, the age of 12 individuals could not be determined. Most (36.7%) of the remaining rainbow trout that were sampled (n = 60) were aged at 2 years old (i.e. two annuli were observed, Figure 13). Another 30.0% of the rainbow trout were aged at 4 years old (four annuli present).

The size distribution of rainbow trout was centred on the 601–650 mm TL size class (Figure 13). Fish between 601 and 650 mm TL made up 34.7% of the entire rainbow trout sample. The second largest size class (600–650 mm TL) were 22.2% of the entire sample. The geometric mean length of all rainbow trout sampled (n = 72) was 612 mm TL and the geometric mean weight was 2,724 grams.

There were 32 stomach samples collected from rainbow trout. Of the 32 samples collected, four were empty. The remaining rainbow trout stomachs contained fishes (89.3%) and invertebrates (10.7%). Fish species identified in rainbow trout stomachs were: shiners (*Notropis* sp.), gizzard shad, rainbow smelt, white bass, white perch, and yellow perch. Invertebrates identified in the stomach samples were one adult Chironomid and one Dipteran pupa. One insect wing was also found in one stomach sample (Table 12).

Walleye

Most walleye (69.6%) were aged at 2 years old. Another 13.0% of the walleye were age–4 fish. The sample from Wheatley Harbour also had one age–12 walleye and one age–13 walleye (Figure 14).

The size distribution of walleye was skewed to the right, with most fish (47.8%) ranging in length from 351–400 mm TL (Figure 14). The geometric mean length for the entire Wheatley Harbour sample was 419 mm TL. The geometric weight for the sample was 615 grams.

One of the ten walleye stomachs collected at Wheatley Harbour was empty. The remaining stomachs all contained fishes. Four of the samples contained gizzard shad. All of the other fishes found in the stomach samples could not be identified (Table 12).

Angler profile

Most boating anglers at Wheatley Harbour used a down-rig device when fishing (61.0%, Table 13). The second most popular angling method from a boat was trolling (36.6%). Drift angling by boaters was also reported (0.9%). Shore anglers most often used a jig (90.8%) or a combination of methods (7.7%).

Most anglers were local residents (89.2%). American anglers were also observed using Wheatley Harbour (8.9%). A small fraction of anglers who fished at Wheatley Harbour were from Ontario but were not local inhabitants (1.4%). Visitors to Wheatley Harbour often made daytrips (7.2%), had another type of paid accommodation (1.1%), or owned a seasonal residence (0.7%).

Comparisons to other surveys

Wheatley Harbour, 2004-2005

The inclusion of Wheatley Harbour in the 2005 western basin sampling schedule allowed for comparisons between 2004 and 2005 data from the access point. The sampling methods used in the 2004 and the 2005 access creel survey were comparable (for 2004 survey methods, see MacDougall et al. 2005). Improvements to the boat launch at Wheatley Harbour had been made between the 2004 and the 2005 access creel survey periods and the repeated sampling of Wheatley Harbour in 2005 allowed for interannual comparisons of access point usage to be made.

The total angling effort estimates for anglers using Wheatley Harbour in 2004 and 2005 differed by only 1.7%, with the 2005 estimates slightly lower than the 2004 data (Table 14). The total angling effort was distributed among key sport fish species in the same manner for both years. Data from both 2004 and 2005 indicate that rainbow trout was the main target species for anglers, followed by yellow perch and walleye (Figure 15).

The yellow perch angling effort estimate was lower in 2005 compared to 2004. While estimated catch of yellow perch was larger in 2005 than it had been in 2004, estimated harvest was not. Observed target yellow perch CUE for Wheatley Harbour in 2005 was higher than the observed target CUE reported for 2004 (MacDougall et al. 2005). Observed yellow perch CUE for all anglers was slightly lower in 2005 compared to 2004.

The rainbow trout angling targeted angling effort estimate for Wheatley Harbour was smaller in 2005 compared to 2004. Catch rates of rainbow trout for both target and all anglers were higher in 2005 than they had been in 2004. Estimated catch and harvest were both larger for the 2005.

The amount of walleye angling effort applied by anglers using Wheatley Harbour was larger in 2005 than it had been in 2004. Estimated catch and harvest of walleye was also higher in 2005 compared to 2004. The walleye CUEs for both target and all anglers was also higher in 2005 than they had been for 2004.

Discussion

Western basin

The 2005 access point creel survey was the first creel survey performed solely one the western basin since 1988 (Hyatt, 1989) and the first access point creel survey performed in the basin. An assessment of shore fisheries as conducted in the 2005 was last performed in a 1985 survey of shore angling at the Leamington, Kingsville, and Wheatley public docks (Hyatt, 1986).

Total angling effort estimates from the eastern and central basins were much larger than the 2005 western basin estimate. The 2005 western basin estimate (including shore angling, which was estimated by both the 2005 and 2004 creel surveys) was 82.5% smaller than the 2004 central basin estimate. The western basin boat angling estimate was 73.2% smaller than the 2003 eastern basin boat angling effort estimate. The distribution of angling effort across the lake as reported in 2003, 2004 and 2005 surveys is similar to the distribution of angling effort previously reported in lakewide aerial creel surveys. In the aerial creel surveys of the entire lake after 1990, western basin angling effort estimates were usually less than estimates from the other two lake basins (81.2–38.6% less for eastern basin–western basin and 17.8–73.0% less for central basin-western basin).

Patterns of western basin anglers were similar to those observed in the eastern basin (2003) and central basin (2004) fisheries, where most angling effort was applied between 14:00 and 20:00. Angling effort differences between weekday and weekend fishing were also similar to figures reported for the eastern basin and central basin (Arnold et al. 2004; MacDougall et al. 2005). Angling pressure in the central and western basins was heaviest during July, while August was the primary month that anglers fished in the eastern basin.

Among the access points, Leamington Municipal Marina had the highest CUEs for all target species of the western basin. The portions of the western basin near the Leamington access point are the deeper regions of the basin. Walleye may use the deeper areas as refuge from warmer water temperatures of the shallower waters of the western basin during the summer. Shoals that are used by yellow perch for foraging are accessible for boaters using Leamington Municipal Marina as an access point for the lake. Prime smallmouth bass habitat (closer to Pelee Island) is also accessible from the Leamington access point.

The increase in CUE for walleye in 2005 (from the 1998 and 1990–1992 aerial creel estimates) can be linked to the strength of the 2003 year class. Walleye from the 2003 year-class (age–2) were the most abundant year class in the biological samples. As yearlings, the 2003 year-class dominated index netting in 2004 (Lake Erie Management Unit, 2005). The 2003 year-class is considered to be the most abundance year-class currently within the lake.

Yellow perch CUE in 2005 was also higher than CUEs from previous creel surveys. This clearly represents the contribution of the 2001 year-class (age–4 fish in 2005), which was considered to be above average in size (Lake Erie Management Unit, 2005). The 2003 year-class of yellow perch was estimated to be another large contributor to both the commercial and recreational fisheries for 2005, however, the contribution of the year-class is not evident in this survey, possibly because recreational anglers may have opted to release yellow perch in this size class more often this year, as the estimated mean total length of the year class during the summer would have been approximately 187 mm.

Isolated angling effort estimates for the western basin from the aerial creel surveys of 1990, 1991, 1992, and 1998 were much larger (125–183%) than the 2005 access point survey angling estimate. This dramatic difference may be accounted for by including some measure of angling effort by boaters who frequented the waters surrounding Pelee Island that launched from and returned to the Ohio shoreline, as the Pelee Island region is close to the Canadian and American boundary dividing Lake Erie. In all of the aerial surveys conducted, a substantial amount of the basin angler effort was in the proximity of Pelee Island (Sztramko 1991, 1992, 1995, 2000). As the 2005 access point creel sampled only from the Ontario shoreline, it censused only anglers using the access points on the northern shore of Lake Erie. While survey questions asked anglers if they had fished in American waters, most anglers answered that they did not fish in the American waters of Lake Erie.

Wheatley Harbour

The collection of creel census data at Wheatley Harbour in 2005 allowed for a direct comparison of angling effort between two sequential years. The use of the Wheatley access point has not increased with the improvements made to the access point over the course of the summer. The renovation of the Wheatley access point was ongoing throughout the summer of 2005 and it is still not complete, thus angler activity may not appreciably increase until the work at the access point is finished.

With the exception of observed yellow perch catch rates for all anglers, the CUEs for all target species at Wheatley Harbour increased in 2005. Estimates for catch and harvest of target species also increased in 2005 (again, the exception being estimated yellow perch harvest). There was a 3° C difference between the mean daily air temperature in the summer (June–August) of 2004 and the summer 2005 (Environment Canada, 2005), which may have influenced the catch rates of sport fish in 2005 as they may been foraging more actively during the day (Brett, 1979).

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Table 1.—Estimated angling effort, catch, harvest and observed CUE from the western Lake Erie access point creel survey, June 7–September 2, 2005.

Species	Targeted effort (rod-hour)	%RSE[b]	Target frequency (%)	Estimated harvest (#)	%RSE	Estimated catch (#)	%RSE	Total harvest (%)	Total catch (%)	Observed CUE (all)[d]	Observed CUE (target)[e]
any species	6132	49	10	0		0		0.0	0.0	0	0
Bluegill	140	89	0	31	92	306	69	0.1	0.3	0.003	1.744
Brown Bullhead	93	94	0	0		153	64	0.0	0.2	0.001	0.23
Burbot	0		0	0		5	89	0.0	0.0	0	
Channel Catfish	3012	29	5	661	17	1566	14	1.4	1.6	0.012	0.435
Common Carp	720	94	1	0		22	23	0.0	0.0	0	0
Freshwater Drum	698	69	1	169	46	16411	8	0.3	17.1	0.285	0.819
Lake Whitefish	45	91	0	0		0.0		0.0	0.0	0	0
Largemouth Bass	454	62	1	18	88	117	45	0.0	0.1	0.002	0.126
Muskellunge	0		0	0		5	88	0.0	0.0	0	
Pumpkinseed	665	75	1	31	92	238	71	0.1	0.2	0.001	0.503
Rock Bass	0		0	0		134	37	0.0	0.1	0.003	
Round Goby	0		0	162	52	2527	17	0.3	2.6	0.022	
Smallmouth Bass	2978	20	5	308	50	1809	20	0.6	1.9	0.03	0.482
Walleye	39851	6	63	26650	9	30203	9	54.9	31.5	0.594	0.788
White Bass	1248	18	2	918	21	8782	11	1.9	9.2	0.171	0.292
White Perch	1533	25	2	2316	19	13504	13	4.8	14.1	0.271	1.042
Yellow Bullhead	52	91	0	51	48	51	48	0.1	0.1	0	0.521
Yellow Perch	9932	8	16	17266	17	20088	16	35.5	20.9	0.408	1.992
Totals	67553[a]		107[c]	48581		95921		100	100		

[a] Total estimated angling effort was 63,364 rod-hours. Targeted effort is higher because some anglers targeted multiple species simultaneously.

[b] relative standard error.

[c] Target frequency is greater than 100% because of anglers targeted multiple species simultaneously.

[d] Calculated from observed catch and observed effort values from all anglers.

[e] Calculated from observed catch and observed effort values from anglers expressly targeting each species.

Table 2.—Estimated angling effort, catch, harvest, and CUE for walleye at each access point from the 2005 western Lake Erie access point creel survey, June 7–September 2, 2005.

Access point	Targeted effort (rod-hour)	%RSE[b]	Target frequency (%)	Estimated harvest (#)	%RSE	Estimated catch (#)	%RSE	Total harvest (%)	Total catch (%)	Observed CUE (all)[c]	Observed CUE (target)[d]
Leamington M. Marina	17078	10	70	11871	15	13231	16	44.5	43.8	0.610	0.842
Cedar Island M. Marina[a]	8216	14	41	5094	19	5610	19	19.1	18.6	0.493	0.72
Colchester Harbour	14557	9	77	9685	10	11361	11	36.3	37.7	0.618	0.739
Totals	39851			26650		30202		100	100		

[a] Cedar Island Municipal Marina is located in Kingsville, Ontario.

[b] relative standard error.

[c] Calculated from observed catch and observed effort values from all anglers.

[d] Calculated from observed catch and observed effort values from anglers expressly targeting each species.

Table 3.—Estimated angling effort, catch, harvest, and CUE for yellow perch at each access point from the 2005 western Lake Erie access point creel survey, June 7–September 2, 2005.

Access point	Targeted effort (rod-hour)	%RSE[b]	Target frequency (%)	Estimated harvest (#)	%RSE	Estimated catch (#)	%RSE	Total harvest (%)	Total catch (%)	Observed CUE (all)[c]	Observed CUE (target)[d]
Leamington M. Marina	5649	10	23	13122	21	15136	19	76.0	75.3	0.626	2.548
Cedar Island M. Marina[a]	2270	14	11	1434	43	1634	38	8.3	8.1	0.151	0.786
Colchester Harbour	2014	22	11	2710	30	3318	27	15.7	16.5	0.177	1.106
Totals	9933			17266		20088		100	100		

[a] Cedar Island Municipal Marina is located in Kingsville, Ontario.

[b] relative standard error.

[c] Calculated from observed catch and observed effort values from all anglers.

[d] Calculated from observed catch and observed effort values from anglers expressly targeting each species.

Table 4.—Estimated angling effort, catch, harvest, and CUE for smallmouth bass at each access point from the 2005 western Lake Erie access point creel survey, June 7–September 2, 2005.

Access point	Targeted effort (rod-hour)	%RSE[b]	Target frequency (%)	Estimated harvest (#)	%RSE	Estimated catch (#)	%RSE	Total harvest (%)	Total catch (%)	Observed CUE (all)[c]	Observed CUE (target)[d]
Leamington M. Marina	1760	29	7	123	87	1160	28	39.9	64.1	0.039	0.541
Cedar Island M. Marina[a]	484	41	2	10	94	194	44	3.2	10.7	0.014	0.364
Colchester Harbour	734	36	4	175	63	455	28	56.8	25.2	0.021	0.37
Totals	2978			308		1809		100	100		

[a] Cedar Island Municipal Marina is located in Kingsville, Ontario.

[b] relative standard error.

[c] Calculated from observed catch and observed effort values from all anglers.

[d] Calculated from observed catch and observed effort values from anglers expressly targeting each species.

Table 5.—Contents of walleye and yellow perch stomachs collected during the 2005 access point creel survey, June 7–September 2, 2005.

Predator species	n	% Empty	Prey item	% Occurrence[a]	Mean % stomach volume
Walleye	49	49.0	unidentified fishes	50.0	7.1
			Notropis sp.	8.3	9.2
			Gizzard shad	4.2	33.3
			White perch	4.2	40.0
			Ephemeropteran nymphs	50.0	1.8
			Earthworms	4.2	10.0
			Insect wings	4.2	0
Yellow perch	11	36.4	unidentified fishes	42.9	22.9
			Gizzard shad	14.3	50.0
			Dreissinid mussels	42.9	15.0
Total	60	46.7			

[a] Percent occurrence for each species may exceed 100% because multiple prey items could have been present in each sample.

Table 6.—The distribution of angling methods, angler origins, and angler accommodation types used by angling parties in western Lake Erie from June 7 to September 2, 2005.

Attribute	Boat parties (%)	Shore parties (%)	All parties (%)
Angling Method			
Still	7.1	84.6	14.1
Jig	1	1.3	1
Drift	5.1		4.7
Troll	81.4		74
Down Rig	1.4		1.3
Spin Cast	2.7	1.3	3.5
Fly Cast		1.3	0.1
Combination/Other	0.9		0.9
Angler Origin			
Local	90.3	96.2	90.8
Ontario	2.9		2.7
Canada			
United States	5.4	3.8	5.2
Other	0.4		0.3
Accommodation Type			
Permanent Resident	89.4	96.2	90
Non-permanent Resident	0.3		0.2
Day Tripper	7.4	2.6	7
Camper - Provincial Park			
Camper - Commercial Park	0.1		0.1
Camper - Crown Land		1.3	
Other - Paid	0.6		0.7
Other - Non-paid	0.4		0.3

Table 7.—Creel survey estimates of the total annual angling effort along with specific effort, catch, harvest estimates for walleye, yellow perch, and smallmouth bass in the western basin of Lake Erie, 1990–2005. Observed CUE for target anglers of walleye, yellow perch, and smallmouth bass are also given.

				Walleye				Yellow perch				Smallmouth bass			
Year[a]	Creel survey type	Angling method	Total estimated effort	Estimated effort	Estimated catch	Estimated harvest	CUE (target)[b]	Estimated effort	Estimated catch	Estimated harvest	CUE (target)	Estimated effort	Estimated catch	Estimated harvest	CUE (target)
1990	Aerial	Boat	116484	73173	37793	33612	0.484	16427	4037	2986	0.176	9725	12057	2264	0.737
1991	Aerial	Boat	143933	136119	40301	38706	0.255	0	2193	1398		2966	3917	747	0.722
1992	Aerial	Boat	114598	105000	22246	19701	0.244	1193	1348	521	0.179	16113	7185	2078	0.176
1998	Aerial	Boat	136695	102645	36506	34352	0.356	191	2631	1702	1.2	22275	10714	4534	0.412
2005	Access	Boat	50774	39617	30203	26650	0.789	9303	20083	17622	2.030	2658	1609	183	0.487
2005	Access	Shore	12590	234	0	0		629	6	0	0.037	321	200	125	0.391
2005	Access	Boat+ Shore	63364	39851	302033	26650	0.788	9932	20088	17266	1.992	2978	1809	308	0.482

[a] Data from the 1990-1992 and 1998 were obtained from aerial creel surveys (Sztramko 1991, 1992, 1995, and 2000).

[b] Calculated from observed catch and observed effort values from anglers expressly targeting each species.

Table 8.—Estimated angling effort, catch, harvest, and CUE at the Wheatley Harbour access point, June 7–September 2, 2005.

Species	Targeted effort (rod-hour)	%RSE[b]	Target frequency (%)	Estimated harvest (#)	%RSE	Estimated catch (#)	%RSE	Total harvest (%)	Total catch (%)	Observed CUE (all)[c]	Observed CUE (target)[d]
any species	1268	20	4	0		0		0.0	0.0	0	0
Brown Trout	156	94	0	9	94	9	94	0.1	0.0	0	0.058
Channel Catfish	0		0	0		650	14	0.0	1.5	0.003	
Chinook Salmon	414	49	1	22	37	22	37	0.1	0.1	0.001	0.045
Common Carp	0		0	0		5	85	0.0	0.0	0	
Freshwater Drum	164	85	0	275	68	4387	10	1.8	10.3	0.148	0.06
Largemouth Bass	0		0	0		10	85	0.0	0.0	0.001	
Pumpkinseed	0		0	0		539	91	0.0	1.3	0.003	
Rainbow Trout	21388	8	59	5495	11	6242	11	35.6	14.7	0.223	0.258
Round Goby	0		0	0		578	49	0.0	1.4	0.007	
Walleye	9122	11	25	1432	14	1718	13	9.3	4.0	0.062	0.144
White Bass	0		0	18	91	75	55	0.1	0.2	0.003	
White Perch	0		0	0		294	91	0.0	0.7	0.002	
Yellow Bullhead	69	85	0	28	85	28	85	0.2	0.1	0	0.4
Yellow Perch	11763	16	32	8159	39	27950	49	52.9	65.8	0.152	2.412
Totals	44344[a]		121[c]	15438		42507		100	100		

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[a] Total estimated angling effort was 36,195 rod-hours. Targeted effort is higher because some anglers targeted multiple species simultaneously.

[b] relative standard error.

[c] Target frequency is greater than 100% because of anglers targeted multiple species simultaneously.

[d] Calculated from observed catch and observed effort values from all anglers.

[e] Calculated from observed catch and observed effort values from anglers expressly targeting each species.

Table 9.—Estimated angling effort, catch, harvest, and CUE for yellow perch at Wheatley Harbour, June 7–September 2, 2005.

Month	Targeted effort (rod-hour)	%RSE[a]	Target frequency (%)	Estimated harvest (#)	%RSE	Estimated catch (#)	%RSE	Total harvest (%)	Total catch (%)	Observed CUE (all)[b]	Observed CUE (target)[c]
June	260	91	11	156	91	156	91	1.9	0.6	0.027	0.601
July	3999	25	24	685	83	4391	72	8.4	15.7	0.08	1.301
August	7504	22	43	7318	43	23403	57	89.7	83.7	0.3	4.347
Totals	11763		78	8159		27950		100	100		

[a] relative standard error.

[b] Calculated from observed catch and observed effort values from all anglers.

[c] Calculated from observed catch and observed effort values from anglers specifically targeting each species.

Table 10.—Estimated angling effort, catch, harvest, and CUE for rainbow trout at Wheatley Harbour, June 7–September 2, 2005.

Month	Targeted effort (rod-hour)	%RSE[a]	Target frequency (%)	Estimated harvest (#)	%RSE	Estimated catch (#)	%RSE	Total harvest (%)	Total catch (%)	Observed CUE (all)[b]	Observed CUE (target)[c]
June	1102	31	5	186	29	225	35	3.4	3.6	0.012	0.201
July	11124	10	25	2128	15	2506	16	38.7	40.1	0.065	0.195
August	9162	14	28	3181	16	3511	16	57.9	56.2	0.138	0.365
Totals	21388			5495		6242		100	100		

[a] relative standard error.

[b] Calculated from observed catch and observed effort values from all anglers.

[c] Calculated from observed catch and observed effort values from anglers specifically targeting each species.

Table 11.— Estimated angling effort, catch, harvest, and CUE for walleye at Wheatley Harbour, June 7–September 2, 2005.

Month	Targeted effort (rod-hour)	%RSE[a]	Target frequency (%)	Estimated harvest (#)	%RSE	Estimated catch (#)	%RSE	Total harvest (%)	Total catch (%)	Observed CUE (all)	Observed CUE (target)
June	210	0	9	18	30	18	30	1.3	1.0	0.014	0.057
July	4266	10	26	661	26	726	27	46.1	42.3	0.054	0.139
August	4645	19	27	754	14	974	13	52.6	56.7	0.085	0.154
Totals	9121		62	1433		1718		100.0	100		

[a] relative standard error.

[b] Calculated from observed catch and observed effort values from all anglers.

[c] Calculated from observed catch and observed effort values from anglers specifically targeting each species.

Table 12.—Contents of yellow perch, rainbow trout, Chinook salmon, and walleye stomachs collected during the 2005 access point creel survey, June 7–September 2, 2005.

Predator species	n	% Empty	Prey species	% Occurrence[a]	Mean % stomach volume
Yellow perch	3		unidentified fishes	66.7	0
			Notropis sp.	33.3	50.0
Rainbow trout	32	12.5	unidentified fishes	60.7	1.8
			Notropis sp.	17.9	32.4
			Gizzard shad	35.7	10.1
			Rainbow smelt	17.9	5.6
			White bass	3.6	4.3
			White perch	14.3	7.4
			Yellow perch	3.6	20.4
			Chironomid adults	3.6	0
			Dipteran pupae	3.6	0
			Insect wings	3.6	0
Chinook salmon	1	100			
Walleye	10	10.0	unidentified fishes	77.8	5.9
			Gizzard shad	44.4	15.0
Total	46	13.0			

[a] Percent occurrence for each species may exceed 100% because multiple prey items could have been present in each sample.

Table 13.—The distribution of angling methods, angler origins, and angler accommodation types used by angling parties at Wheatley Harbour from June 7 to September 2, 2005.

Attribute	% Boat Parties	% Shore Parties	% of All Parties
	Angling Method		
Still	0.9		21.9
Jig		90.8	1.4
Drift	0.9		0.7
Troll	36.6		28.4
Down Rig	61		46.8
Spin Cast			0.4
Fly Cast		1.5	
Combination/Other	0.5	7.7	0.4
	Angler Origin		
Local	86.9	96.9	89.2
Ontario	1.9		1.4
Canada			
United States	9.9	3.1	8.3
Other			
	Accommodation Type		
Permanent Resident	86.9	95.4	88.8
Non-permanent Resident	0.9		0.7
Day Tripper	8.5	3.1	7.2
Camper - Provincial Park			
Camper - Commercial Park			
Camper - Crown Land			
Other - Paid	1.4		1.1
Other - Non-paid	0.5		0.4

Table 14.— Estimates of the total annual angling effort along with specific effort, catch, harvest estimates for yellow perch, rainbow trout and walleye for Wheatley Harbour anglers, 2004–2005. Observed CUE for target anglers of yellow perch, rainbow trout, and walleye are also given.

				Yellow Perch				Rainbow Trout				Walleye			
Year[a]	Creel Survey Type	Angling Method	Total Estimated Effort	Estimated Effort	Estimated Catch	Estimated Harvest	CUE (target)[b]	Estimated Effort	Estimated Catch	Estimated Harvest	CUE (target)	Estimated Effort	Estimated Catch	Estimated Harvest	CUE (target)
2004	Access	Boat	23992	1796	1830	1805	0.605	22367	4214	4161	0.137	3845	239	159	0.048
2005	Access	Boat	22786	37	7	0		21388	6242	5495	0.258	9122	1718	1432	2.376
2004	Access	Shore	12822	10721	10898	9001	1.134	13	0	0		54	36	36	0.286
2005	Access	Shore	13409	11726	27943	8159	2.495	0	0	0		0	0	0	
2004	Access	Boat+ Shore	36815	12518	12728	10806	0.941	22380	4214	4161	0.137	3899	275	195	0.05
2005	Access	Boat+ Shore	36195	11763	27950	8159	2.412	21388	6242	5495	0.258	9122	1718	1432	0.144

[a] Data from the 1990-1992 and 1998 were obtained from aerial creel surveys (Sztramko 1991, 1992, 1995, and 2000).

[b] Calculated from observed catch and observed effort values from anglers expressly targeting each species.

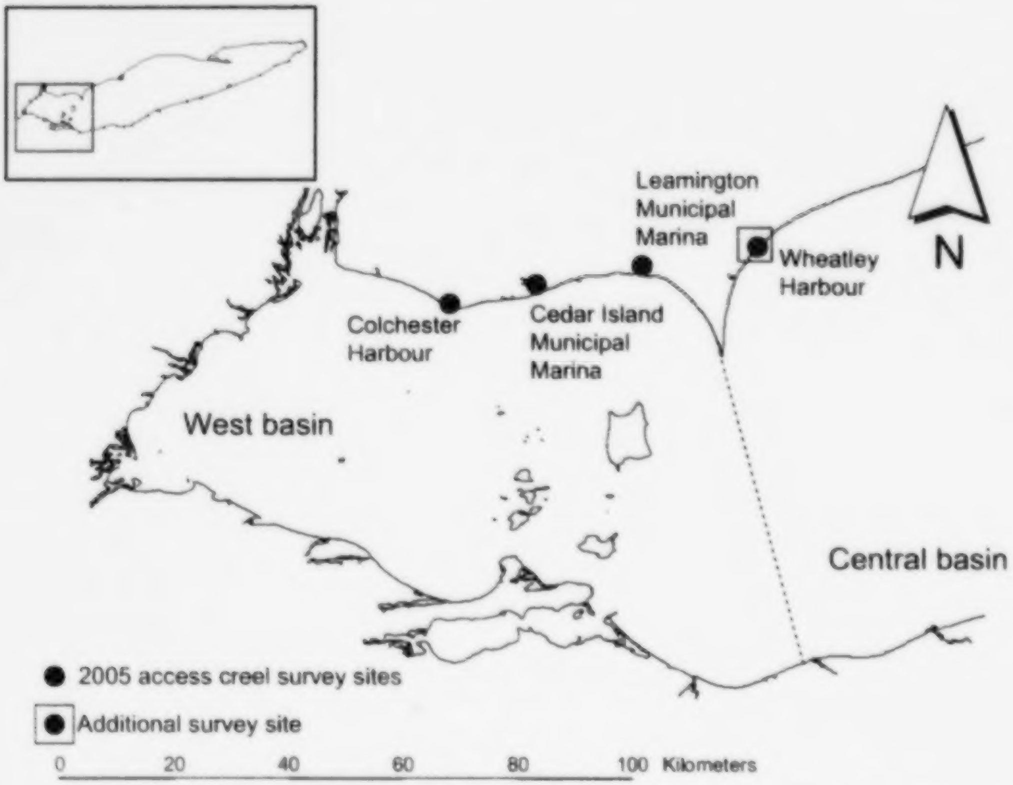

Leamington
Municipal
Marina
Wheatley
Harbour
N
Colchester
Harbour
Cedar Island
Municipal
Marina
West basin
Central basin
● 2005 access creel survey sites
● Additional survey site
0 20 40 60 80 100 Kilometers

Figure 1.—Survey locations for the western basin access point creel survey, June 7–September 2, 2005.

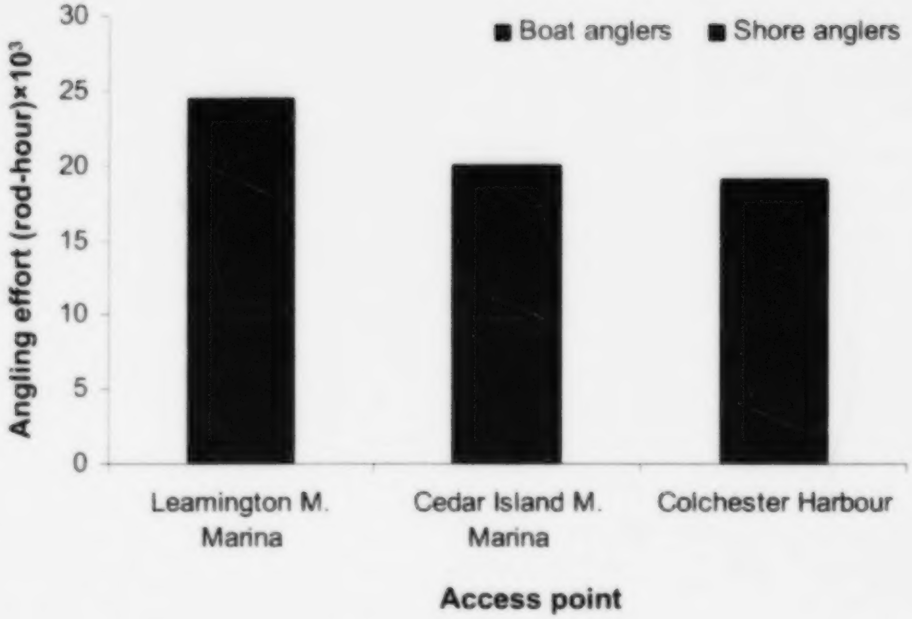


Figure 2.—Distribution of estimated angling effort (rod-hours) of both shore and boat anglers for each access point surveyed in the 2005 western basin creel survey.

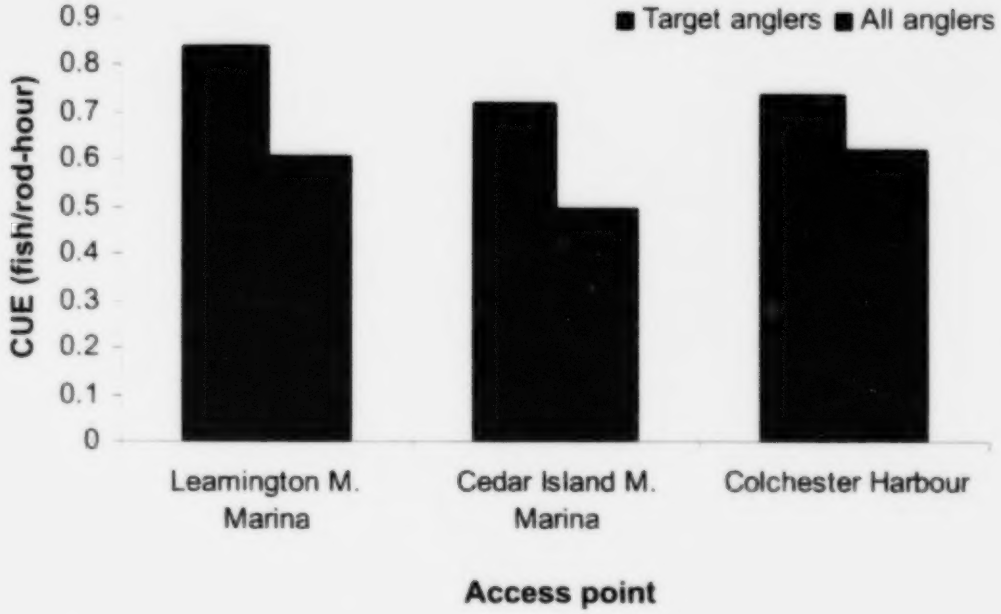


Figure 3.—Catch per unit effort (CUE) observations for walleye in western Lake Erie for June 7 to September 2, 2005. CUE was calculated from observed catch and observed effort for both anglers targeting walleye (target anglers) and all anglers.

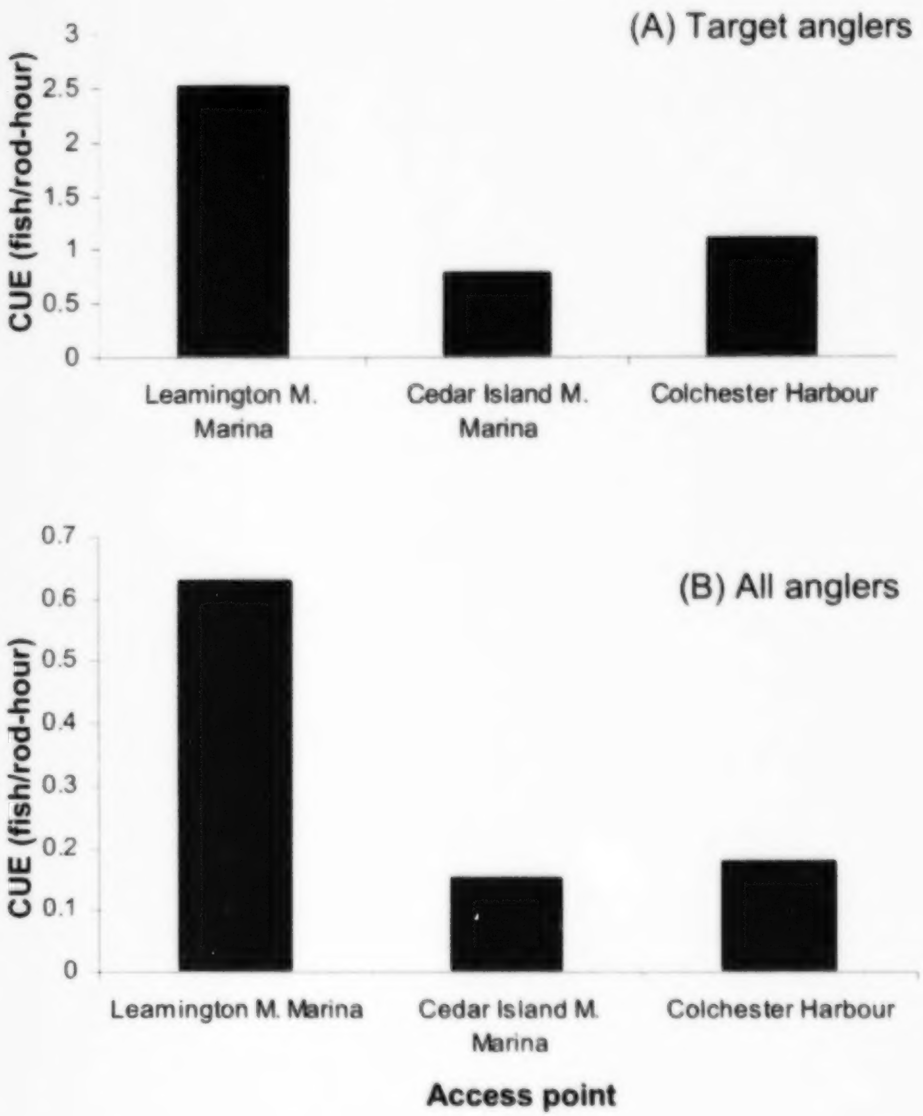


Figure 4.—Catch per unit (CUE) observations for yellow perch in western Lake Erie for June 7 to September 2, 2005. CUE was calculated from observed catch and observed effort data for both anglers targeting yellow perch (A) and all anglers (B).

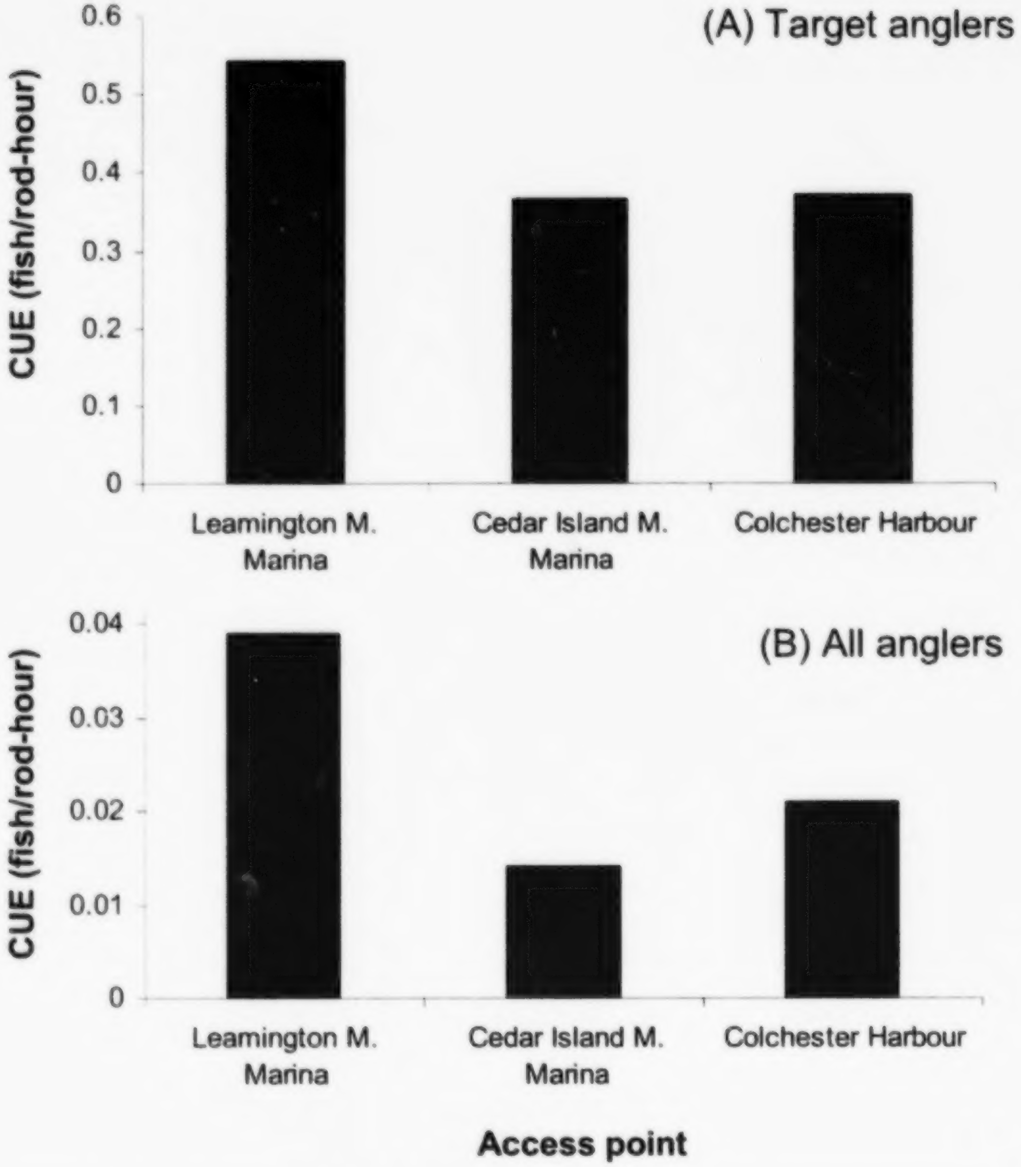


Figure 5.—Catch per unit effort (CUE) observations for smallmouth bass in western Lake Erie from June 7 to September 2, 2005. CUE was calculated from observed catch and observed effort for both anglers targeting smallmouth bass (A) and all anglers (B).

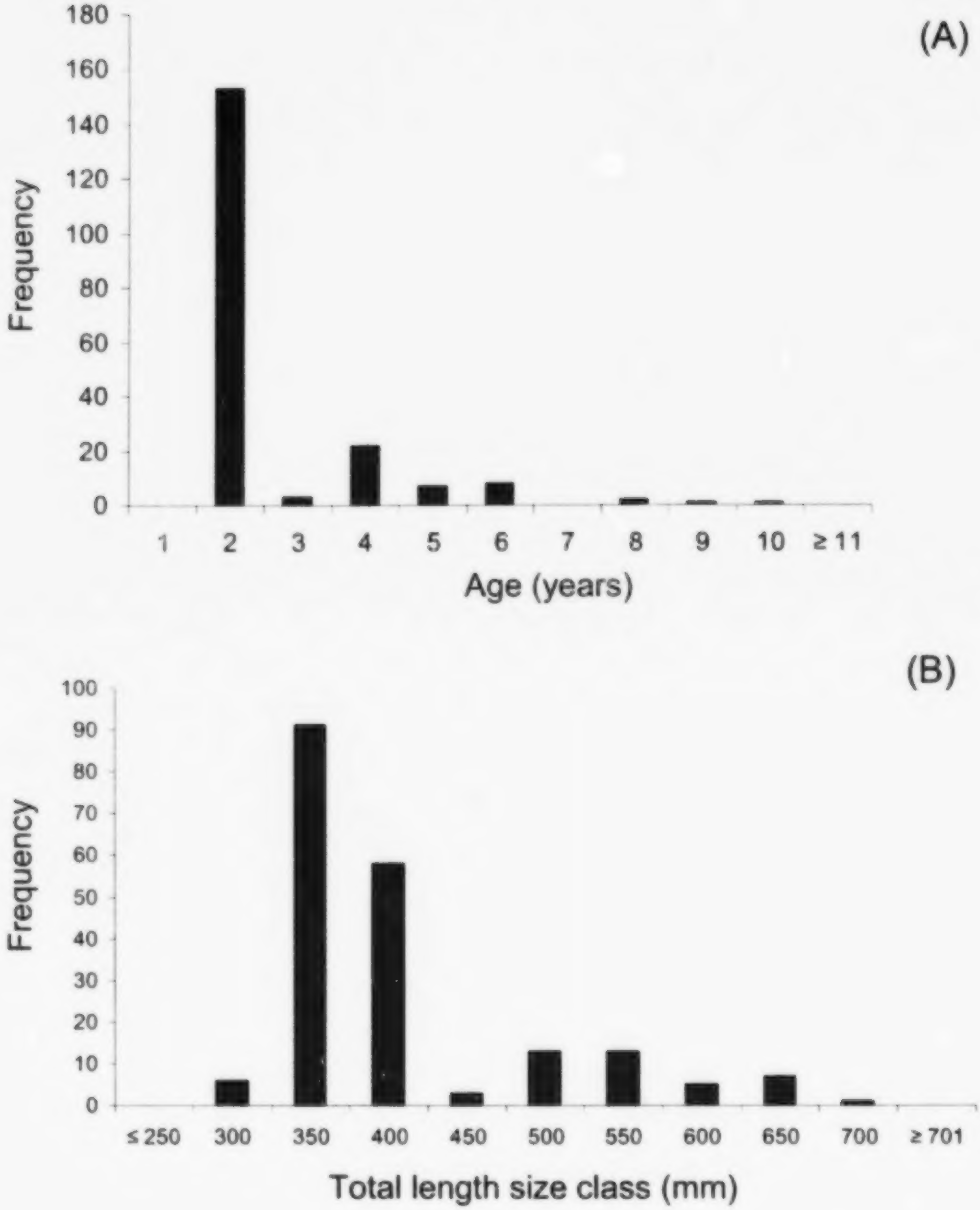


Figure 6.—Distribution of ages (A) and total lengths (B) of walleye (n = 197) sampled from the western basin access point creel survey, June 7–September 2, 2005. Length size classes are named after the maximum length per each class (i.e. size class 251–300 mm is presented as "300").

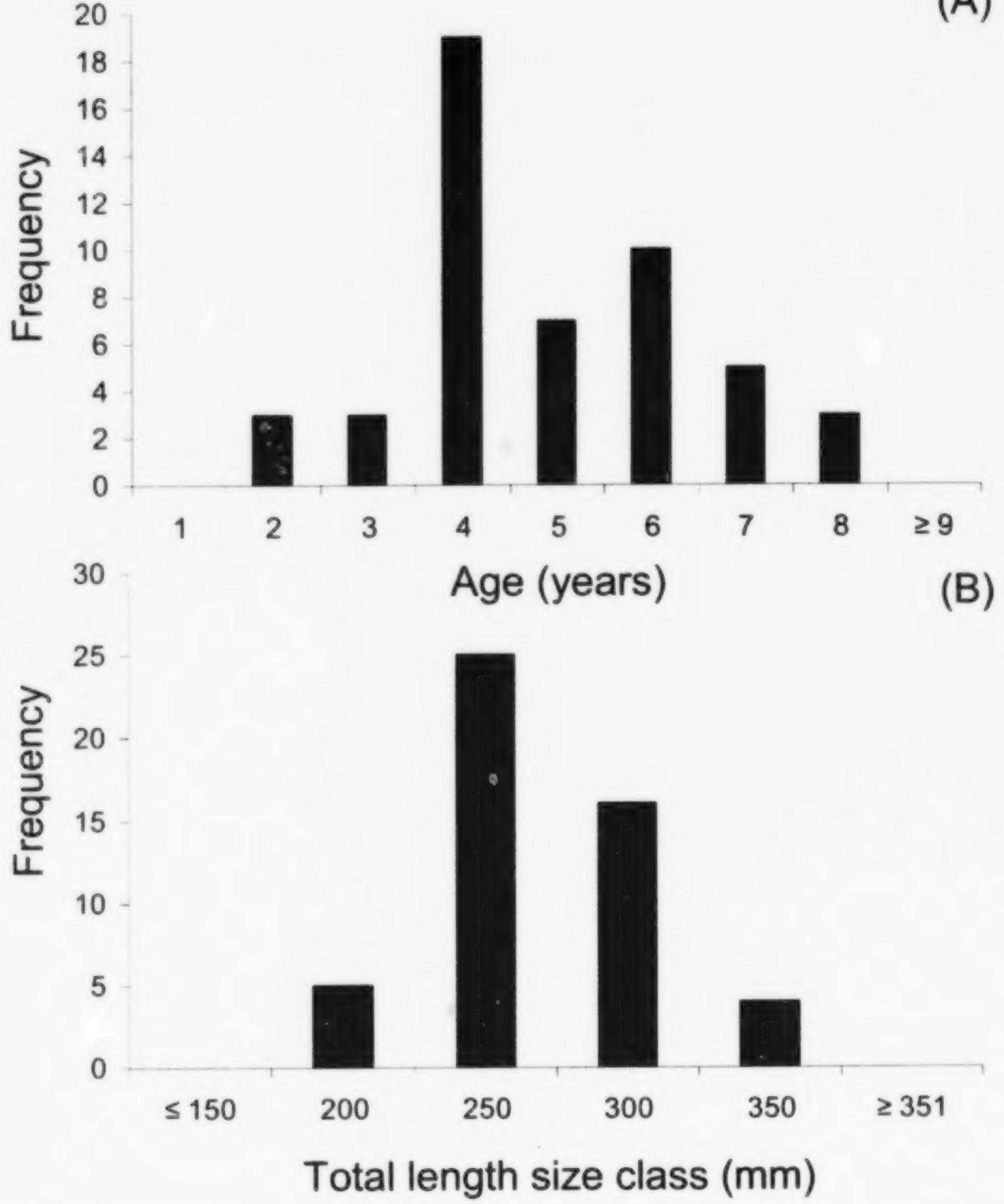


Figure 7.—Distribution of ages (A) and total lengths (B) of yellow perch (n = 50) sampled from the western basin access point creel survey, June 7–September 2, 2005. Length size classes are named after the maximum length per each class (i.e. size class 251–300 mm is presented as "300").

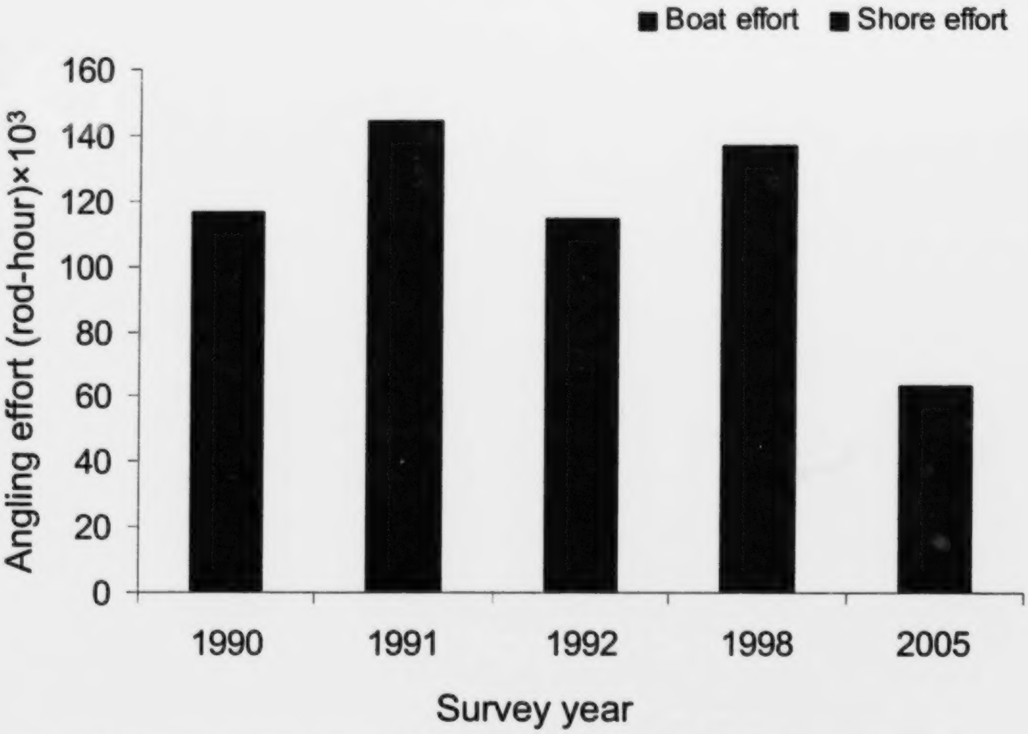


Figure 8.—Total angling estimates from western basin aerial creel surveys (1990-1998) and the 2005 access point survey. Shore angling estimates were only collected for the 2005 access creel survey.

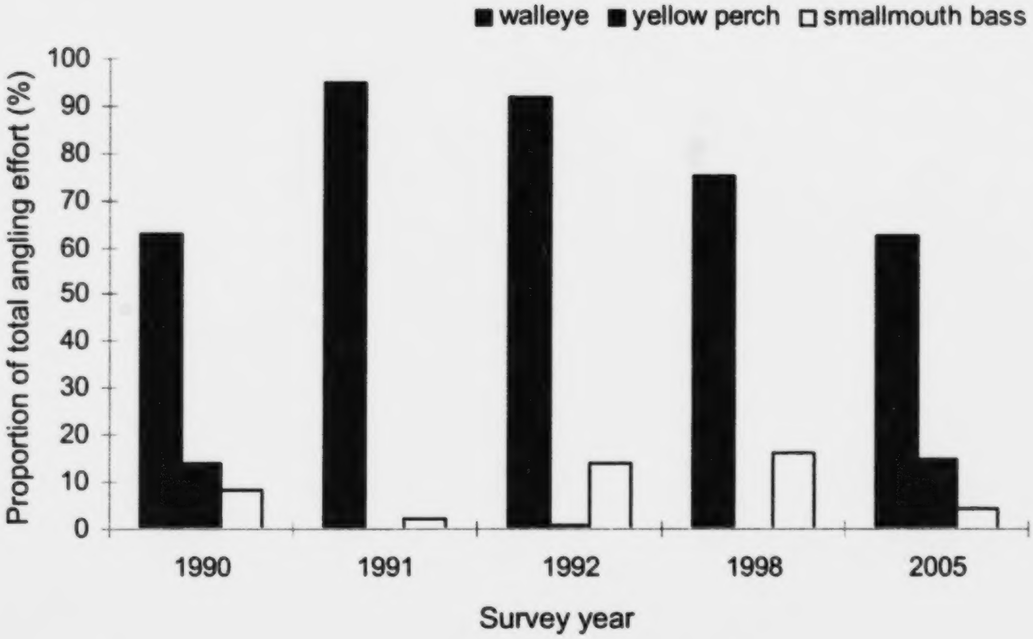


Figure 9.—Proportion of the total angling effort directed at walleye, yellow perch, and smallmouth bass in the western basin as estimated in aerial (1990–1992, 1998) and access point (2005) creel surveys. Angling effort data for 2005 does not include shore effort estimates. Shore angling effort data for 2005 increased walleye, yellow perch, and smallmouth bass effort proportions by 0.4%, 1.0%, and 0.5%, respectively.

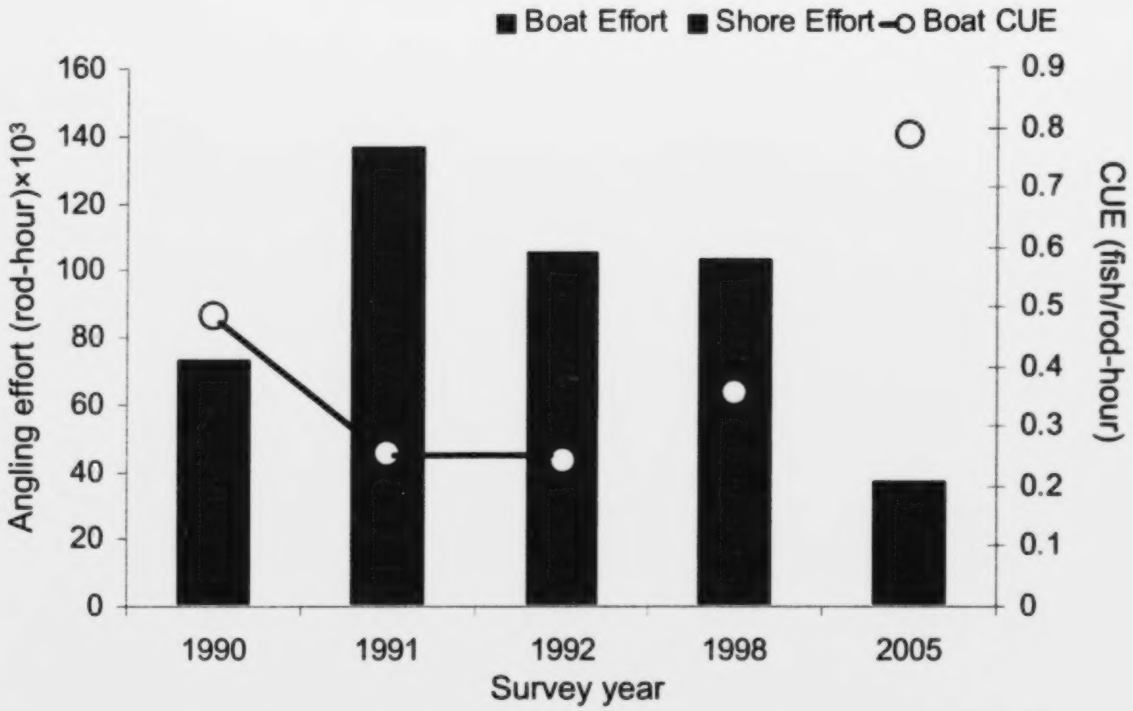


Figure 10.—Estimated angling effort directed at walleye along with catch per unit effort (CUE) observations for the western basin of Lake Erie from aerial (1990–1992, 1998) and access point (2005) creel surveys. Shore angling effort (0.6% of total walleye effort) data were only available for the 2005 survey year.

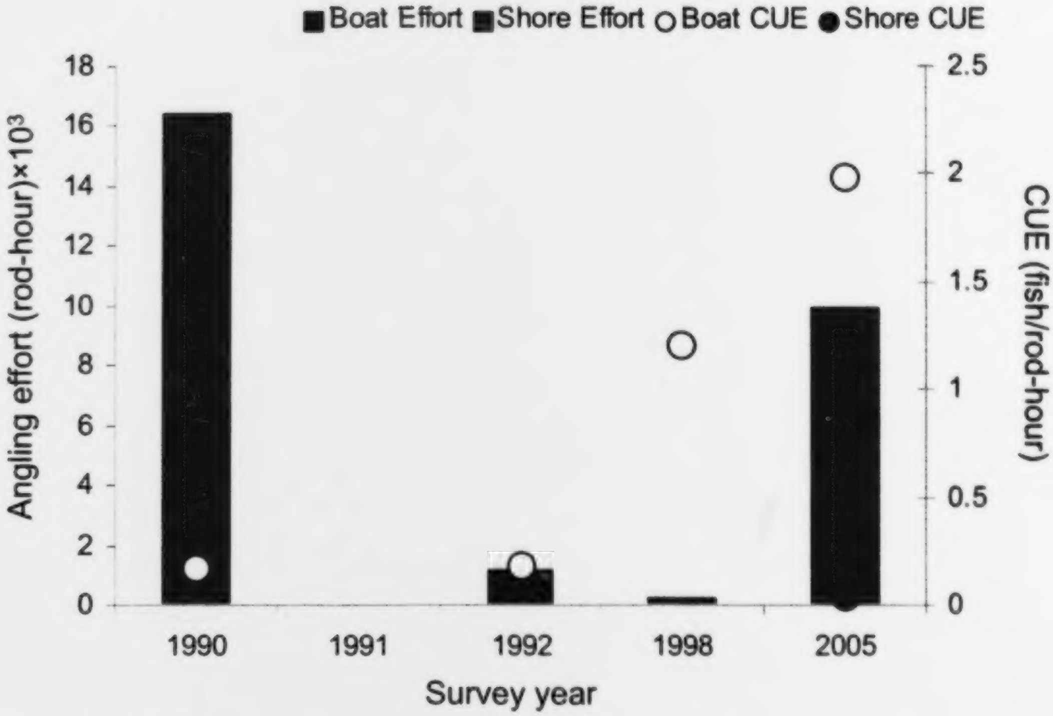


Figure 11.—Estimated angling effort directed at yellow perch along with catch per unit effort (CUE) observations for the western basin of Lake Erie from aerial (1990–1992, 1998) and access point (2005) creel surveys. Shore angling effort and CUE data were only available for the 2005 survey year.

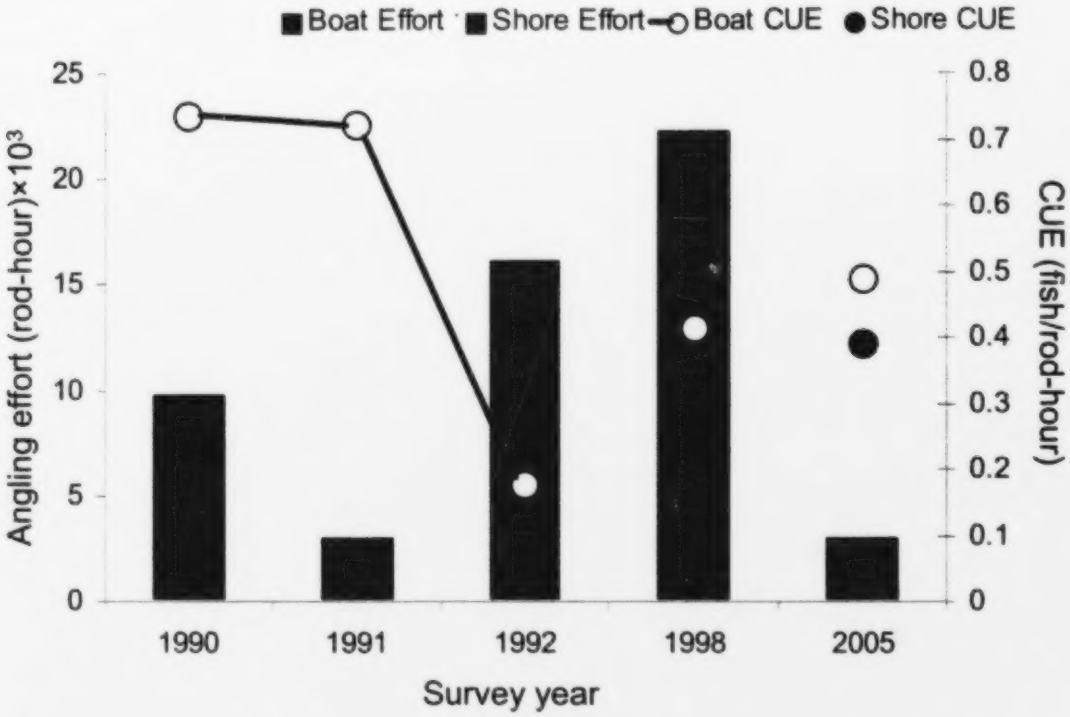


Figure 12.—Estimated angling effort directed at smallmouth bass along with catch per unit effort (CUE) observations for the western basin of Lake Erie from aerial (1990–1992, 1998) and access point (2005) creel surveys. Shore angling effort and CUE data were only available for the 2005 survey year.

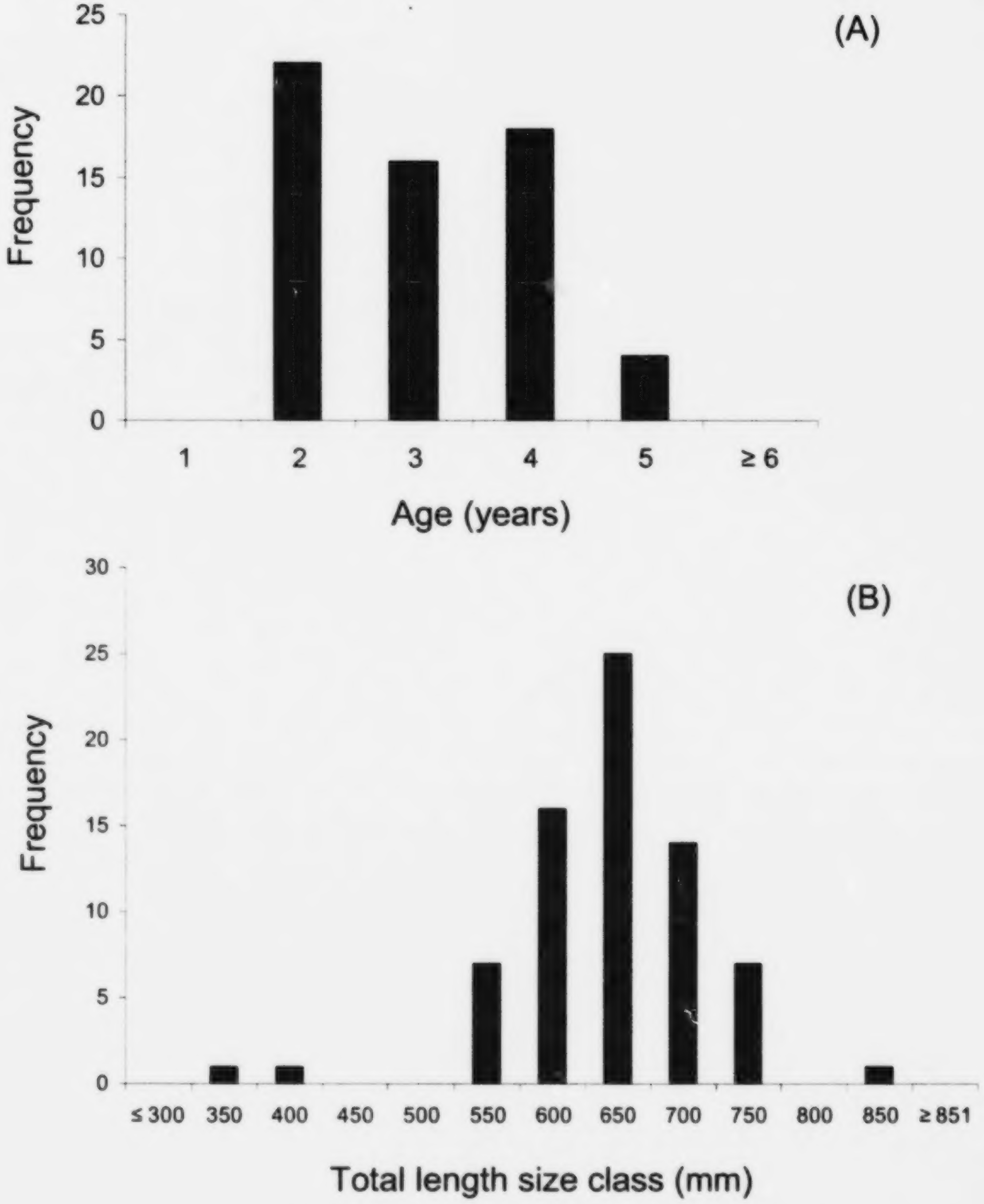


Figure 13.—Distribution of ages (A, n = 60) and total lengths (B, n = 72) of rainbow trout sampled from Wheatley Harbour, June 7–September 2, 2005. Length size classes are named after the maximum length per each class (i.e. size class 251–300 mm is presented as "300").

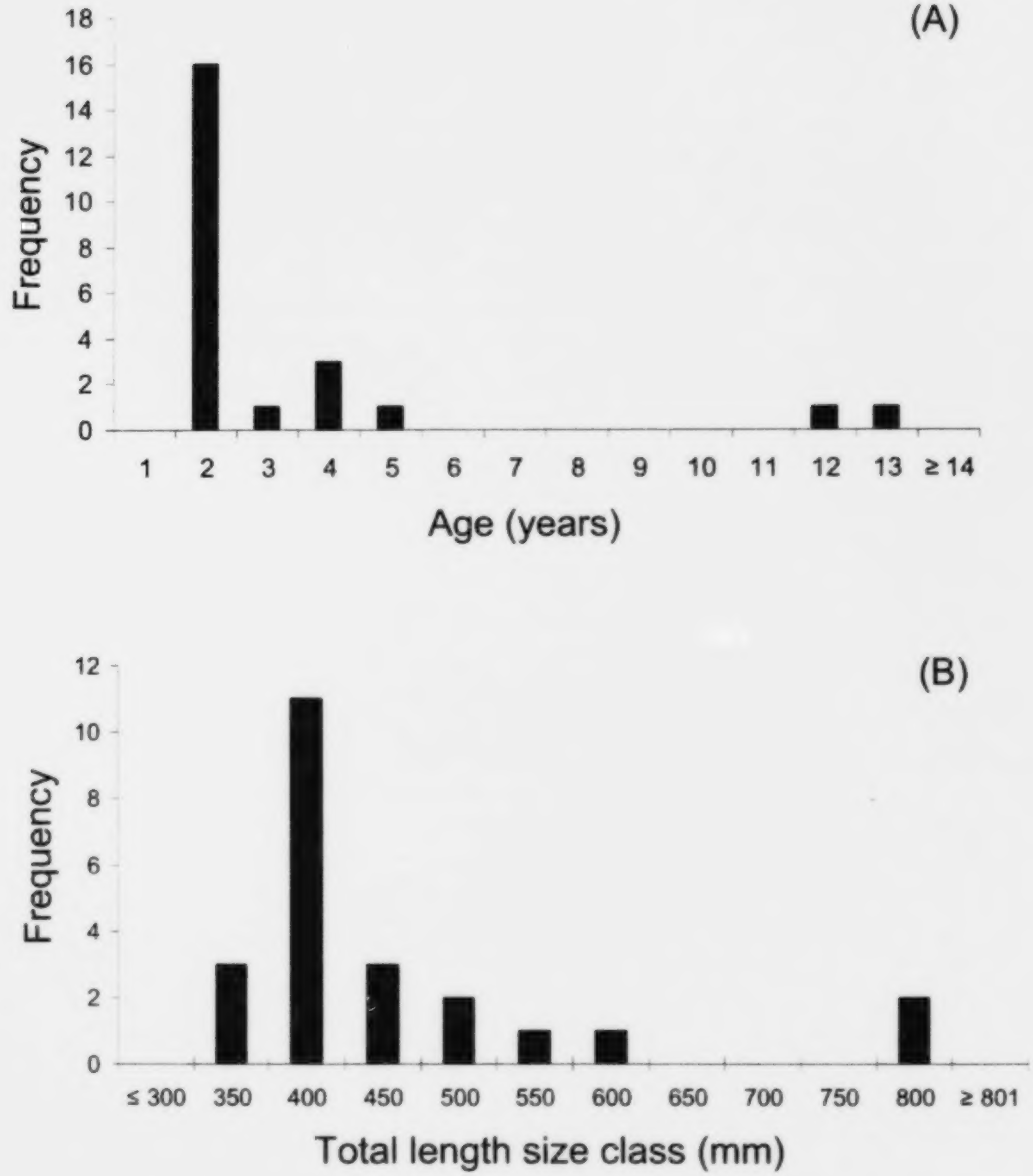


Figure 14.—Distribution of ages (A) and total lengths (B) of walleye (n = 23) sampled from Wheatley Harbour, June 7–September 2, 2005. Length size classes are named after the maximum length per each class (i.e. size class 251–300 mm is presented as "300").

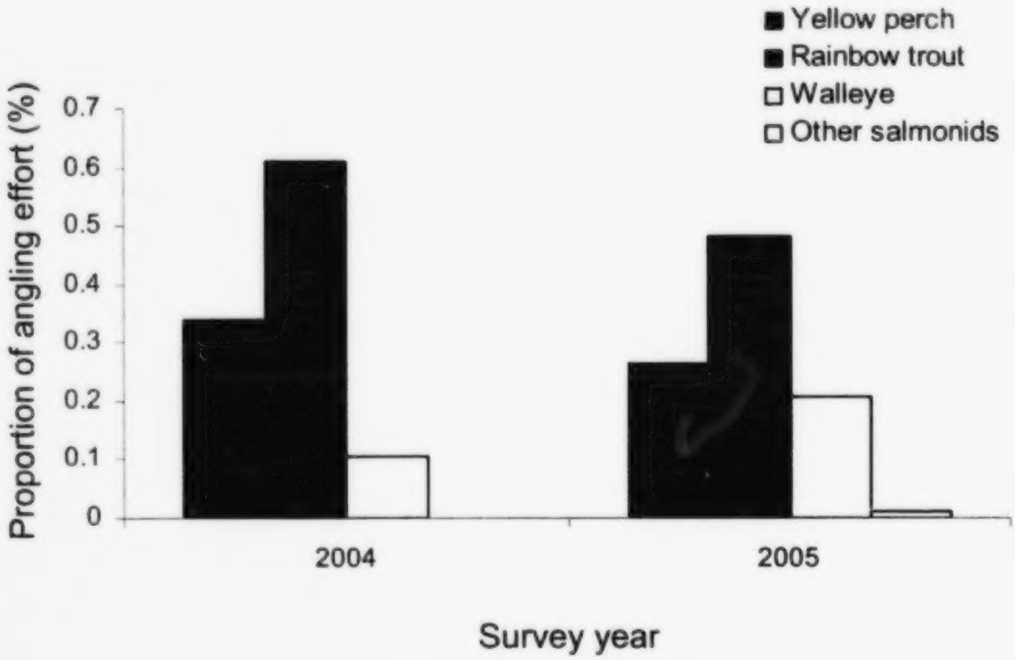


Figure 15.—Distribution of Wheatley Harbour angler effort among major sport fish species, 2004–2005.

Appendix 1.—Sampling schedule for the western basin access creel survey, June 7–September 2, 2005.

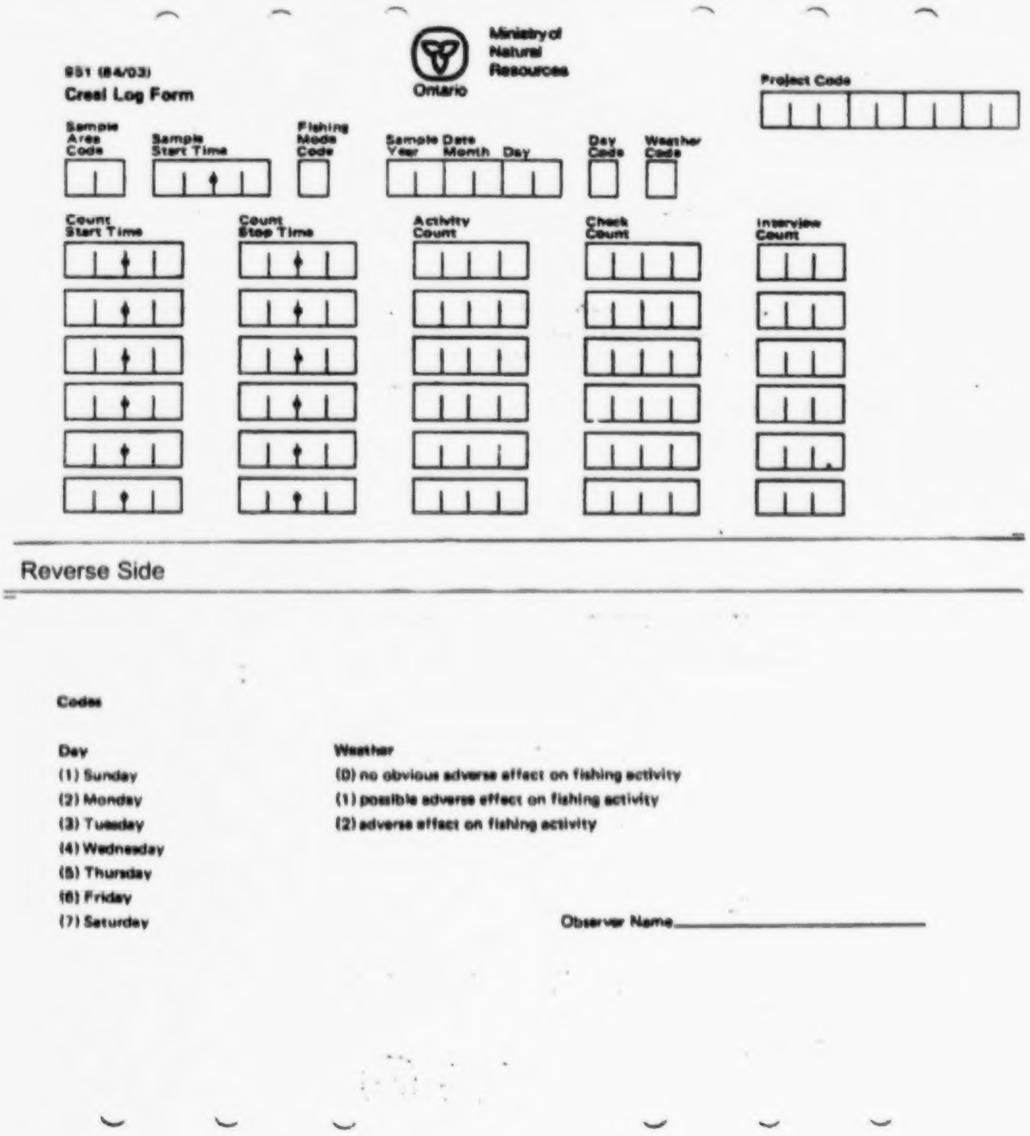
Monday		Tuesday		Wednesday		Thursday		Friday		Saturday		Sunday	
Date[a]	Shift[b]-Site[c]	Date	Shift-Site	Date	Shift-Site	Date	Shift-Site	Date	Shift-Site	Date	Shift-Site	Date	Shift-Site
		06/07	A3	06/08	A3/P2	06/09	P3	06/10	P3	06/11	A2/P4	06/12	A4
06/13		06/14	A1/P3	06/15	P1	06/16	P2	06/17	A4/P4	06/18	A3/P1	06/19	P2
06/20	A3/P4	06/21	P4	06/22		06/23	A4	06/24	A2/P1	06/25	A1	06/26	A2/P3
06/27	A1/P2	06/28	A2	06/29	A2	06/30	A3/P4	07/01		07/02	A3	07/03	A2/P4
07/04	A1	07/05	A1/P4	07/06		07/07	A3/P4	07/08	P3	07/09	A1	07/10	A2/P3
07/11	P2	07/12	A3/P1	07/13	P4	07/14		07/15	A1/P4	07/16	A2	07/17	A4/P2
07/18	A3/P1	07/19	A2	07/20	A1	07/21	A2/P2	07/22		07/23	A1/P4	07/24	P3
07/25	A4	07/26		07/27	A4/P3	07/28	P3	07/29	A4/P2	07/30	P2	07/31	A1/P1
08/01		08/02	A2/P3	08/03	A4	08/04	A1/P2	08/05	A3	08/06	P2	08/07	A4/P3
08/08	A1	08/09	A4	08/10	P2	08/11	A4/P1	08/12	P2	08/13	A3/P1	08/14	P4
08/15		08/16	P2	08/17	A1/P1	08/18	P3	08/19	A4/P3	08/20	A1	08/21	A2/P4
08/22	P1	08/23	A1/P4	08/24	A3	08/25	A2/P4	08/26		08/27	A2/P3	08/28	A3
08/29	A3/P1	08/30		08/31		09/01	A4	09/02	P2				

[a] Dates are given in the form MM/DD.

[b] Census shifts are represented by (A) 08:00–14:00; and (P) 14:00–20:00. Shifts occurring on the same day are separated by a forward slash.

[c] Sites are represented as follows: (1) Wheatley Harbour; (2) Leamington Municipal Marina; (3) Cedar Island Municipal Marina; and (4) Colchester Harbour.

Appendix 2.1.—An example of the OMNR Creel Log Form No. 951 (84/03).



Ministry of Natural Resources

Ontario

951 (84/03)

Creel Log Form

Project Code

Sample Area Code

Sample Start Time

Fishing Mode Code

Sample Date Year Month Day

Day Code

Weather Code

Count Start Time

Count Stop Time

Activity Count

Check Count

Interview Count

Reverse Side

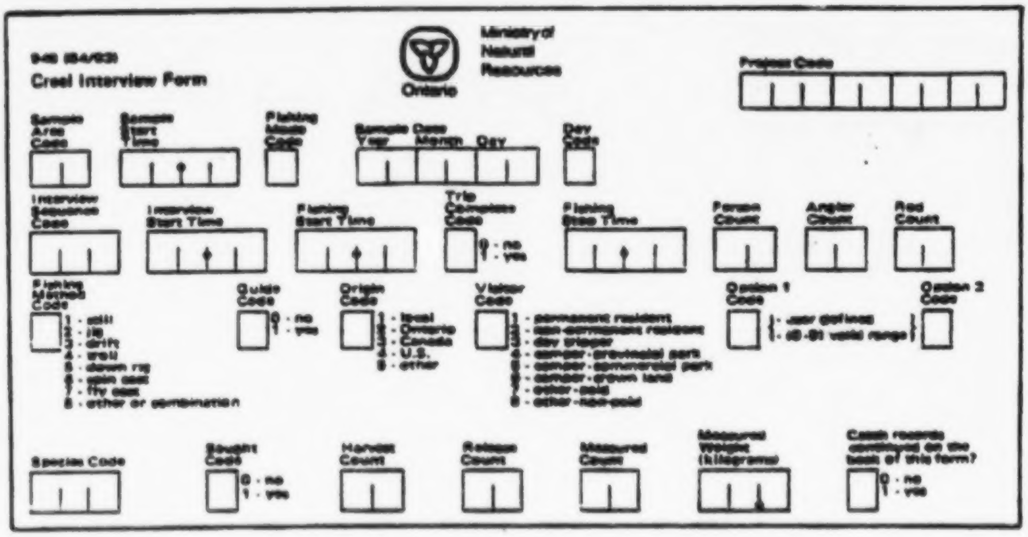
Codes

Day
(1) Sunday
(2) Monday
(3) Tuesday
(4) Wednesday
(5) Thursday
(6) Friday
(7) Saturday

Weather
(0) no obvious adverse effect on fishing activity
(1) possible adverse effect on fishing activity
(2) adverse effect on fishing activity

Observer Name______________________

Appendix 2.2.—An example of OMNR Creel Interview Form No. 948 (84/03).



948 (84/03)
Creel Interview Form

Ontario
Ministry of
Natural
Resources

Project Code

Sample Area Code

Sample Start Time

Fishing Mode Code

Sample Date
Year Month Day

Day Code

Interview Sequence Code

Interview Start Time

Fishing Start Time

Trip Complete Code
0 - no
1 - yes

Fishing Stop Time

Person Count

Angler Count

Rod Count

Fishing Method Code
1 - still
2 - jig
3 - drift
4 - troll
5 - down rig
6 - spin cast
7 - fly cast
8 - other or combination

Guide Code
0 - no
1 - yes

Origin Code
1 - local
2 - Ontario
3 - Canada
4 - U.S.
5 - other

Visitor Code
1 - permanent resident
2 - non-permanent resident
3 - day tripper
4 - camper - provincial park
5 - camper - commercial park
6 - camper - crown land
7 - other - paid
8 - other - non-paid

Option 1 Code

Option 2 Code

user defined
(0 - 9 valid range)

Species Code

Sought Code
0 - no
1 - yes

Harvest Count

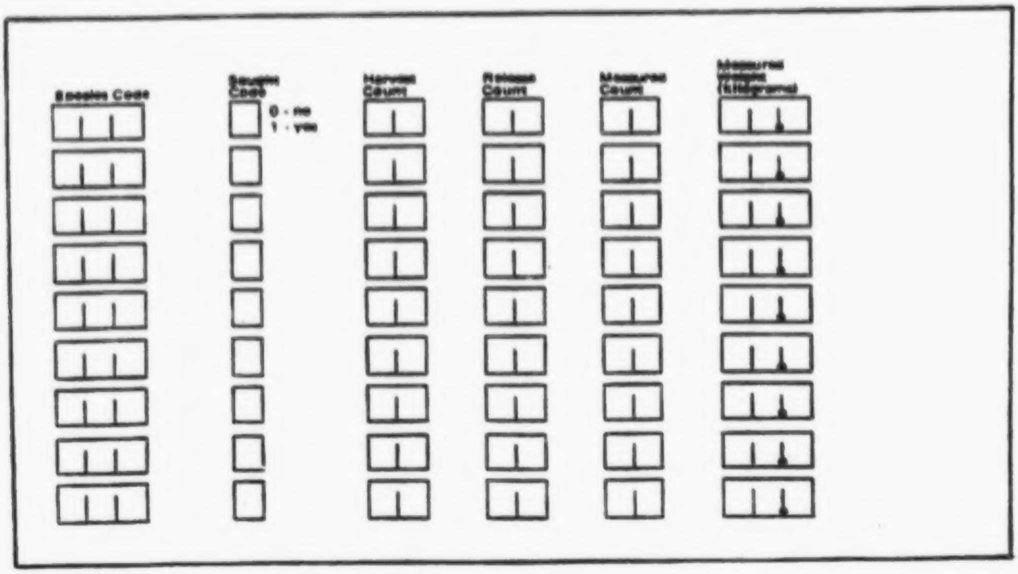
Release Count

Measured Count

Measured Weight (kilograms)

Catch records continued on the back of this form?
0 - no
1 - yes

Reverse Side



Species Code

Sought Code
0 - no
1 - yes

Harvest Count

Release Count

Measured Count

Measured Weight (kilograms)

Appendix 3.—Formulae from FISHNET version 2.0 for the calculations used to generate creel estimates via the 2-stage estimation process (Lester and Korver, 1996).

Daily Estimates

Activity

Initial Estimate of Fishing Trips ($TRIPNE_{hij}$)

$$TRIPNE_{hij} = ATYCNT_{hij}$$

Where:
ATYCNT = activity count
h = stratum
i = sample day
j = line of creel log form

Total Number of Trips During Sampled Stratum–Period ($TRIPNE_{hi}$)

$$TRIPNE_{hi} = \sum_{j} TRIPNE_{hij}$$

Effort

Estimated Party Effort ($EFFPE_{hi}$)

$$EFFPE_{hi} = TRIPNE_{hi} \times \frac{\sum_{k} EFFDUR_{hik}}{CIF\_NN_{hi}}$$

Where:
CIF_NN = number of interviews
EFFDUR = individual party effort (fishing trip duration)
k = interview

Estimated Angler Effort ($EFFAE_{hi}$)

$$EFFAE_{hi} = TRIPNE_{hi} \times \frac{\sum_{k} EFFAO_{hik}}{CIF\_NN_{hi}}$$

Where party-angler effort ($EFFAO_{hik}$) is defined as:

$$EFFAO_{hik} = EFFDUR_{hik} \times ANGLERS_{hik}$$

Given:
ANGLERS = mean number of anglers/party

Estimated Rod Effort ($EFFRE_{hi}$)

$$EFFRE_{hi} = TRIPNE_{hi} \times \frac{\sum_k EFFRO_{hik}}{CIF\_NN_{hi}}$$

Where angler-rod effort ($EFFRO_{hik}$) is defined as:

$$EFFRO_{hik} = EFFDUR_{hik} \times RODS_{hik}$$

Given:
RODS = mean number of rods/angler

Catch and Harvest

Daily Estimate of Catch ($CATNE_{hi}$)

$$CATNE_{hi} = TRIPNE_{hi} \times \frac{\sum_k CATNO_{hik}}{CIF\_NN_{hi}}$$

Where:
CATNO = number of fish of a selected species

Daily Estimate of Harvest ($HVSNE_{hi}$)

$$HVSNE_{hi} = TRIPNE_{hi} \times \frac{\sum_k HVSNO_{hik}}{CIF\_NN_{hi}}$$

Where:
HVSNO = number of fish harvest

Targeted Effort, Catch, and Harvest

Targeted Effort ($EFFAE1_{hi}$)

$$EFFAE1_{hi} = TRIPNE_{hi} \times \frac{\sum_k EFFAO1_{hik}}{CIF\_NN_{hi}}$$

Where:
EFFAO1 = EFFAO when the species was sought (EFFAO1 = 0 otherwise)

Targeted Catch (CATNE1$_{hi}$*)*

$$\text{CATNE1}_{hi} = \text{TRIPNE}_{hi} \times \frac{\sum_{k} \text{CATN01}_{hik}}{\text{CIF\_NN}_{hi}}$$

Where:
CATNO1 = CATNO when party was seeking the species (CATNO1 = 0 otherwise)

Targeted Harvest (HVSNE1$_{hi}$*)*

$$\text{HVSNE}_{hi} = \text{TRIPNE}_{hi} \times \frac{\sum_{k} \text{HVSNO1}_{hik}}{\text{CIF\_NN}_{hi}}$$

Where:
HVSNO1 = HVSNO when party was seeking the species (HVSNO1 = 0 otherwise)

Stratum Estimates

Stratum estimates of total effort, catch, and harvest are calculated by averaging daily estimates and expanding by the number of days in the stratum. For example, the total effort for a stratum is estimated as:

$$\text{EFFAE}_h = \text{STRAT\_DAYS}_h \times \text{meanEFFAE}_h$$

Where:

$$\text{meanEFFAE}_h = \frac{\sum_{i} \text{EFFAE}_{hi}}{\text{SAM\_DAYS}_h}$$

Given:
SAM_DAYS = number of days sampled
STRAT_DAYS = number of days in the stratum

Variance of stratum estimates

Using the same example as above, variance (σ2) is calculated as:

$$\sigma^2\,(\text{EFFAH}_h) = \text{FPC}_h \times \text{STRAT\_DAYS}_h^{\,2} \times \sigma^2(\text{meanEFFAE}_{hi)}$$

Where FPC (finite population correction factor):

$$FPC = 1 - \frac{SAM\_DAYS_h}{STRAT\_DAYS_h}$$

And where σ^2(meanEFFAE$_{hi}$), or the variance of the daily mean is calculated as:

$$\sigma^2(\text{meanEFFAE}_h) = \frac{s^2}{SAM\_DAYS}$$

Given that sample variance, s^2 is calculated as:

$$s^2 = \frac{\left\lfloor \sum (\text{EFFAE}_{hi} - \text{meanEFFAE}_h)^2 \right\rfloor}{(SAM\_DAYS_h - 1)}$$

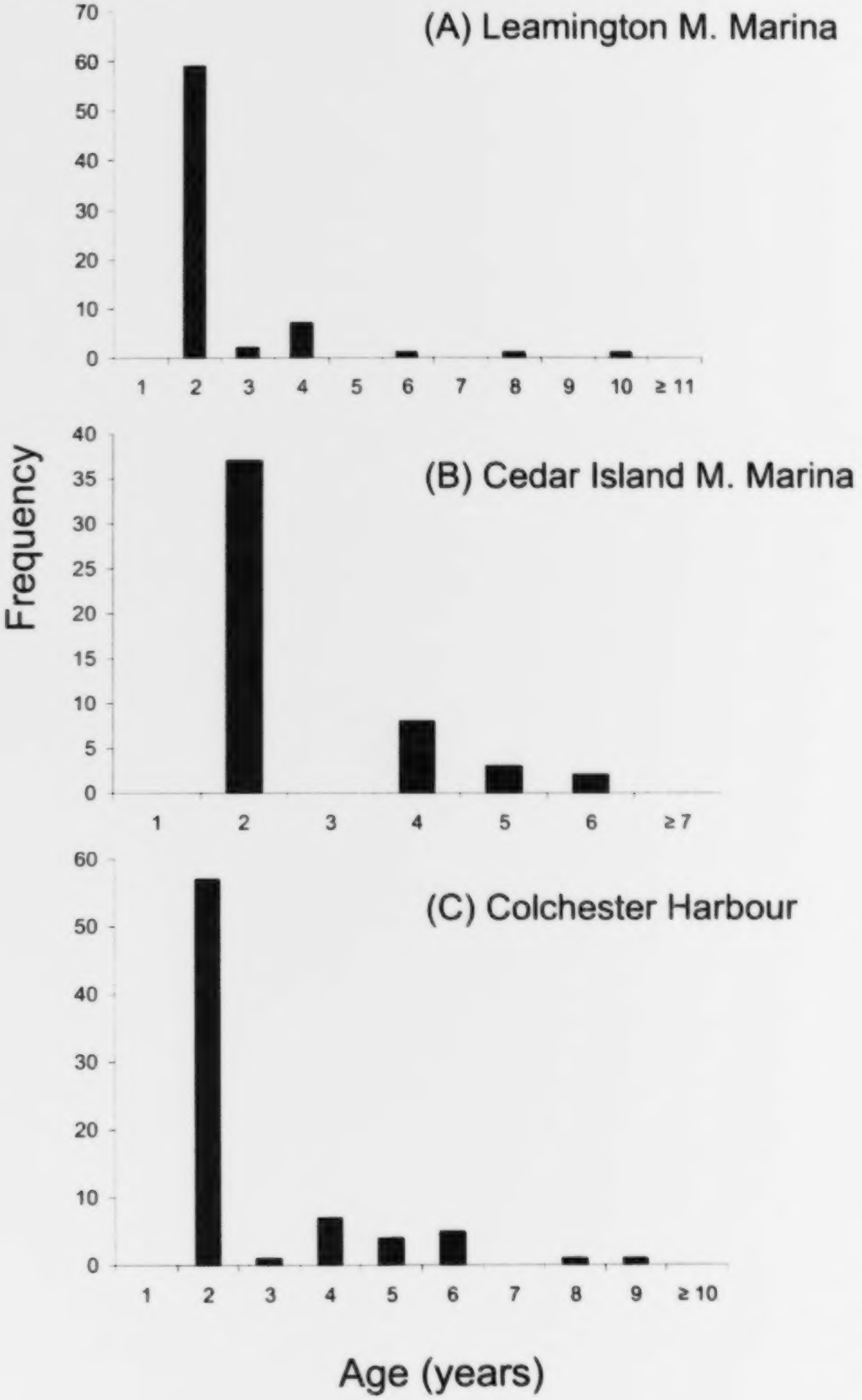
Relative Standard Error

Relative standard error of an estimate is calculated using:

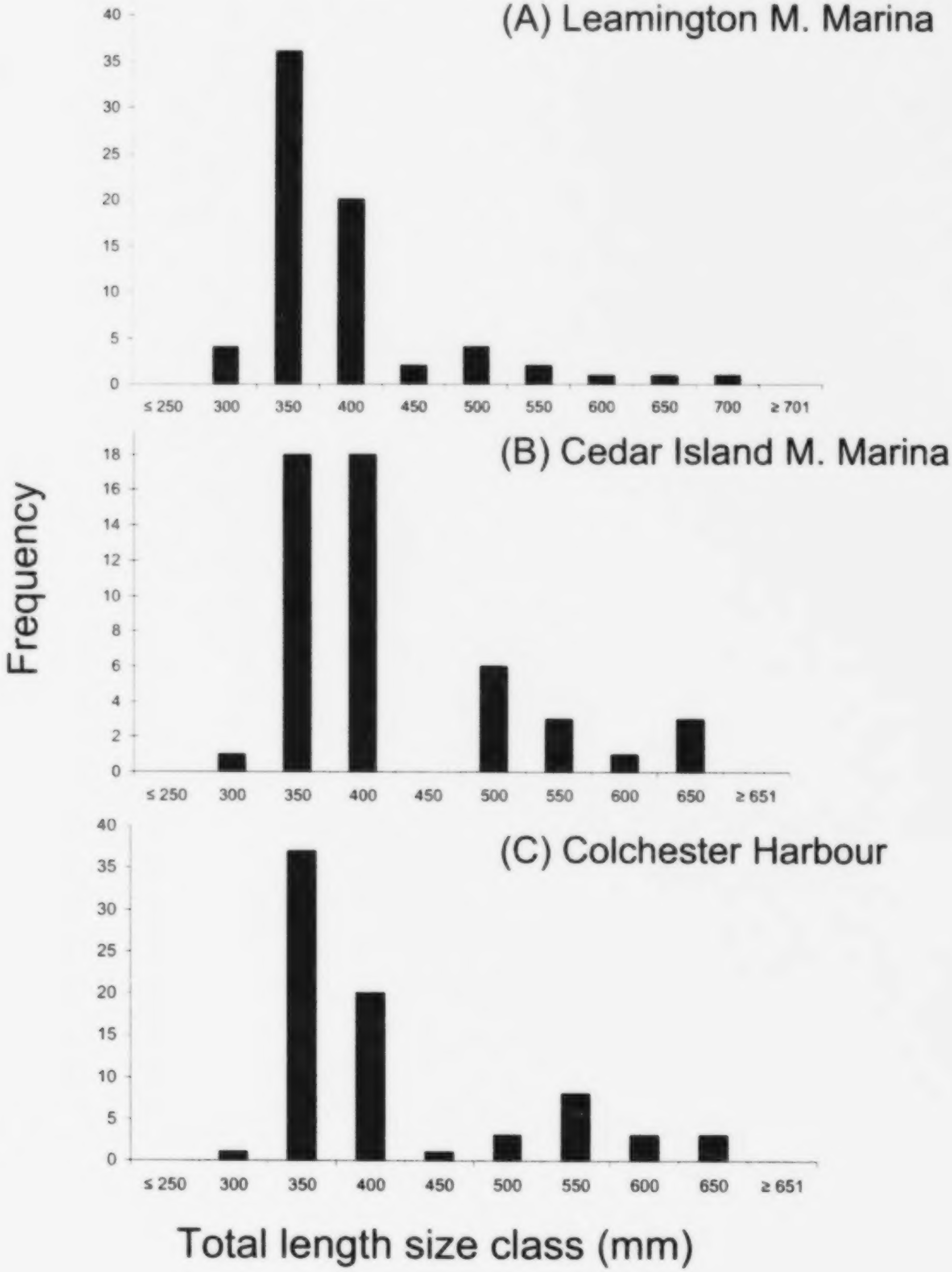
$$RSE = 100 \times \left(\frac{SE_r}{r}\right)$$

Where:
SE_r = standard error of the estimate
r = estimate

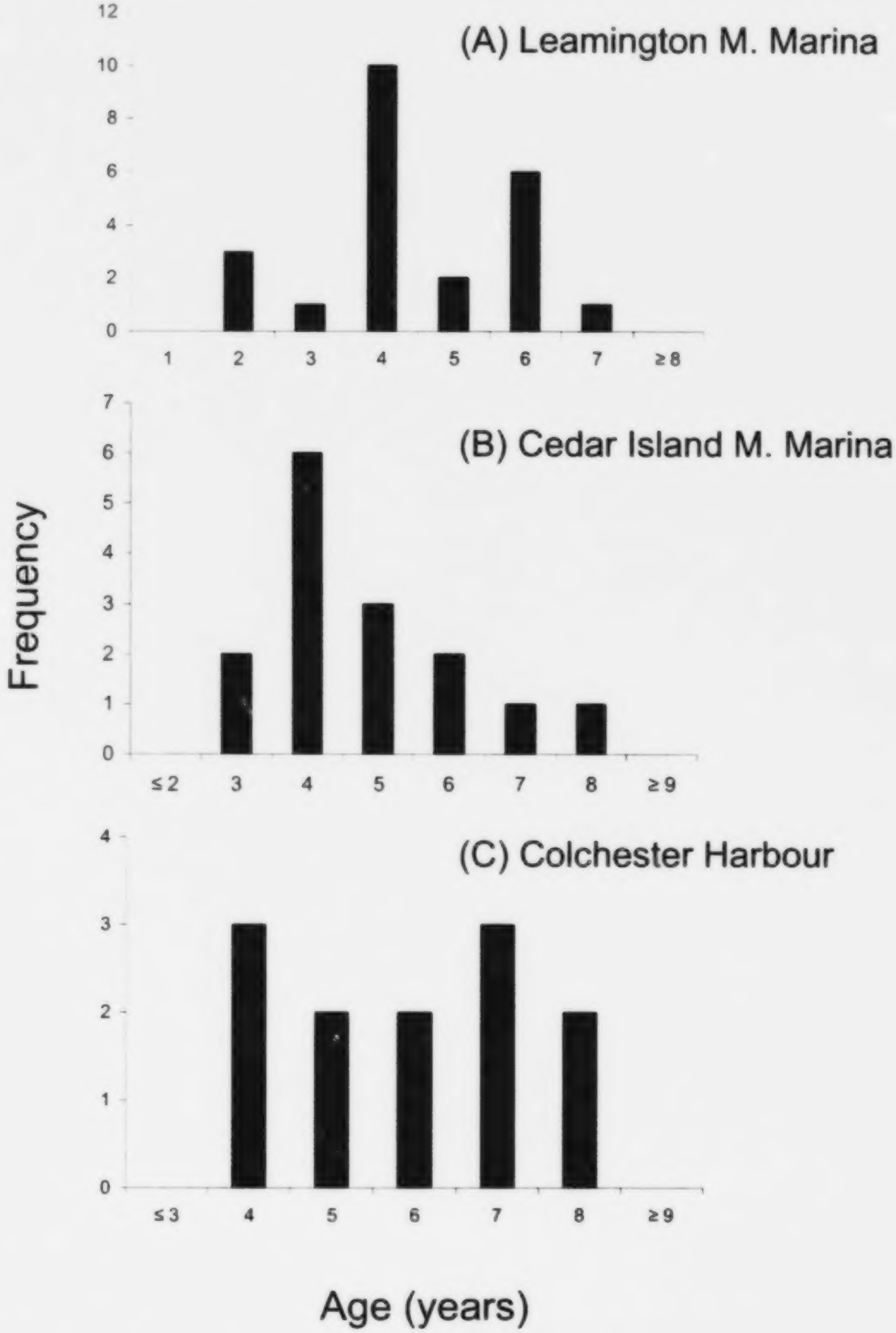
Appendix 4.1.—Age distribution of walleye sampled at each access point during the 2005 summer creel survey.



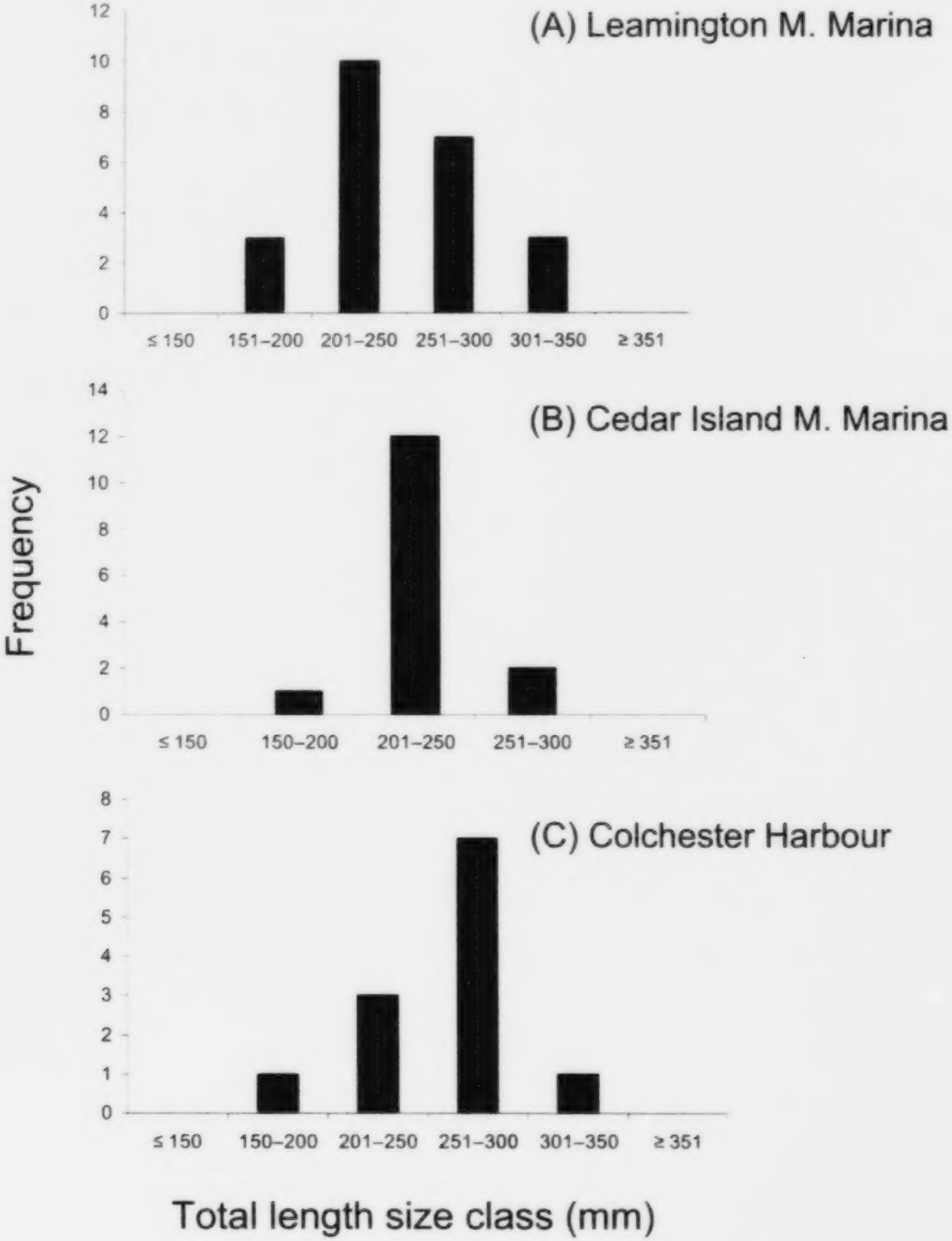
Appendix 4.2.—Size distribution of walleye sampled at each access point during the 2005 summer creel survey. Length size classes are named after the maximum length per each class (i.e. size class 251–300 mm is presented as "300").



Appendix 4.3—Age distribution of yellow perch sampled at each access point during the 2005 summer creel survey.



Appendix 4.4.—Size distribution of yellow perch sampled at each access point during the 2005 summer creel survey. Length size classes are named after the maximum length per each class (i.e. size class 251–300 mm is presented as "300").



Young-of-year Fish Index Survey in the Canadian Waters of Lake St. Clair, 2005

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Introduction

The purpose of the young-of-year (YOY) index survey was to assess the abundance of the 2005 year-class for the target species of largemouth bass, smallmouth bass, yellow perch and walleye. Index surveys of YOY fish in Lake St. Clair have been performed in various years by both the Lake St. Clair and Lake Erie Fisheries Assessment Units. During previous surveys, the index fishing program sampling areas were determined and sampling protocols were developed (Ward, 1979). The 2005 YOY index fishing was a continuation of the previous studies.

Methods

Nine sites were sampled across the time period of eight weeks, from June 6–July 28, 2005: Bradley's Marsh, Belle River east, Belle River west, Laforet's Beach, Mitchell's Bay inside, Mitchell's Bay outside, Puce River, Peter Street, and the St. Luke Club (Figure 1). Adapted from the grouping of stations used in Ward (1979), stations were grouped using Stoney Point on the shore of Lake St. Clair as a point of reference. Sampling occurred between the hours of 0800 and 1600. A total of 108 seine hauls were performed during the sampling period (Table 1).

The sampling gear was a 100 metre seine net. Prior to towing the seine, environmental conditions were recorded. The environmental conditions recorded for each seine haul were: cloud cover, precipitation, air temperature, wind speed (categorical), wind direction, water surface temperature, wave height (categorical), Secchi disc depth, and water depth. After environmental sampling, the seine was hauled for 30 metres at each sample site, so that seining effort was standardised by the length of the tow.

All fish species captured in a seine haul were sorted by species and counted. Young-of-year fish species that were considered target species and were individually measured were largemouth bass, smallmouth bass, yellow perch, and walleye. Larval fishes caught in the seine were not identified but were counted as YOY fishes.

Results

Environmental conditions

Although water temperatures for each station were variable during the survey, most stations showed a trend of increasing water temperature from the start of sampling to the completion of the survey (Figure 2). Water temperatures on the first day of sampling, June 6, 2005, were 25°C. Water temperatures on the final day of sampling, July 28, 2005 were 23°C. The maximum water temperature recorded was 30°C (June 28, 2005) and the mean water temperature during the survey period was 25.2°C.

Survey catch summary

A total of 9,031 fishes were captured during the survey. Of the total catch, 44.8% (4,048 fishes) were young-of-year (YOY) fishes. Most of the YOY fishes captured (3,103 fishes, 76.6%) were larval fishes (Table 2). There were 4,983 fishes captured that were determined to at least age–1. There were 342 age–1+ fishes not identified.

Of the identified YOY fishes, 73.3% of the total catch was largemouth bass. A further 19.5% of the catch was smallmouth bass. Yellow perch made up 2.2% of the total catch, and no YOY walleye were captured during the entire survey. Of the non-target species, the capture of brook silverside YOY made up 4.5% of the total YOY catch.

Largemouth bass

Largemouth bass YOY first appeared in samples in the third week of sampling, June 20 to June 24 (Table 3). Largemouth bass YOY were caught at all sampling sites, although from week to week, catches were inconsistent for all sample sites. In general for all sites, catches of YOY largemouth bass were highest during the initial weeks of observation in the seine catch (weeks three and four) and then catches of YOY largemouth bass tapered off. The survey catch rate of YOY largemouth bass was highest in the sites east of Stoney Point, especially at the Peter Street site.

Smallmouth bass

The first week that smallmouth bass YOY were observed in the seine was also week three (Table 4). At the Belle River west site, an individual YOY smallmouth bass was caught during week three, and this was the only occasion that YOY smallmouth bass were observed. For all remaining sites except the Peter Street site, smallmouth bass YOY catches were the highest at sample sites during the fourth, fifth, or sixth week of the survey. The survey catch rate of YOY smallmouth bass was highest at the St. Luke Club site.

Yellow perch

Yellow perch were also first caught during the third week of sampling for all sites except those deemed as northeast of Stoney Point (Table 5). Yellow perch YOY were never caught at either Mitchell's Bay sites or at the St. Luke Club site. Catches of YOY yellow perch generally peaked during the third and fifth weeks for the sites east of Stoney Point, and sites west of Stoney Point generally had peaks in YOY yellow perch abundance in weeks five and six. The highest survey catch rate for YOY yellow perch occurred at the Laforet's Beach site.

Comparison of catch rates for target fish species, 1996 and 2005

The CUEs for target fish species obtained from the 2005 survey were compared to the CUEs obtained from index survey data collected in 1996 (Table 6). Walleye were collected in index seine hauls in 1996, at the Mitchell's Bay sites. Smallmouth bass CUEs were higher in 1996 as compared to 2005 at the Laforest's Beach site. Largemouth bass CUEs in 2005 were usually higher than 1996 values. Sites with higher largemouth bass CUEs in 1996 as compared to 2005 were St. Luke club, Bradley's Marsh, Belle River east, and Puce River. The magnitude of the total catch of YOY largemouth bass at the St. Luke Club sight in particular caused the overall largemouth bass CUE for 1996. The yellow perch were caught at sites in 2005 where they had been absent in the 1996 surveys, and a few sites (Belle River west, Puce River) had higher CUEs in 2005 as compared to 1996. In general, the catch rates of centrarchids were higher in 2005 as compared to 1996, and the opposite trend was present for percids.

Discussion

The percid fish community found during June and July of Lake St. Clair has changed over time. In the 1979 study, young-of-year walleye (358 in total) were found at Bradley's Marsh, Laforet's Beach, Belle River, and the Puce River (Ward, 1979). There were no walleye found in 2005. There were 2,635 YOY yellow perch caught in 249 seine hauls in 1979 (CUE of 10.6 fish per seine haul), while in 2005 only 21 yellow perch YOY appeared in the 108 seine hauls (CUE = 0.19).

References

Ward, B.W. 1979. Young-of-year index fishing program in the Canadian waters of Lake St. Clair, 1979. Lake St. Clair Fisheries Assessment Unit Report 1979-3. 46p.

Table 1.—Sampling frequency for each site during the 2005 young-of-year index survey.

Site	Seines
Bradley's Marsh	10
Belle River east	13
Belle River west	14
Laforet's Beach	14
Mitchell's Bay inside	8
Mitchell's Bay outside	11
Puce River	14
Peter Street	14
St. Luke Club	10
Total	108

Table 2.—Summary of the catch and catch per unit effort (CUE) of all fish species and life stages observed in seine hauls from the YOY index fishing program on Lake St. Clair, 2005.

Fish species	Life stage[a]	Total catch	CUE (fish/seine haul)[b]
longnose gar	OLS	5	0.05
alewife	OLS	7	0.06
gizzard shad	OLS	94	0.87
quillback	OLS	4	0.04
white sucker	OLS	1	0.01
silver redhorse	OLS	1	0.01
golden redhorse	OLS	1	0.01
common carp	OLS	4	0.04
eastern silvery minnow	OLS	56	0.52
emerald shiner	OLS	429	3.97
spottail shiner	OLS	1708	15.81
spotfin shiner	OLS	7	0.06
sand shiner	OLS	2	0.02
mimic shiner	OLS	698	6.46
bluntnose minnow	OLS	167	1.55
fathead minnow	OLS	1	0.01
blacknose dace	OLS	15	0.14
silver shiner	OLS	10	0.09
channel catfish	OLS	2	0.02
banded killifish	OLS	118	1.09
white perch	OLS	50	0.46
white bass	OLS	13	0.12
rock bass	OLS	5	0.05
pumpkinseed	OLS	36	0.33
bluegill	OLS	127	1.18
smallmouth bass	OLS	100	0.93
largemouth bass	OLS	23	0.21
yellow perch	OLS	88	0.81
johnny darter	OLS	2	0.02
logperch	OLS	15	0.14
brook silverside	OLS	826	7.65
round goby	OLS	18	0.17
tubenose goby	OLS	8	0.07
unidentified	OLS	342	3.17
smallmouth bass	YOY	185	1.71
largemouth bass	YOY	695	6.44
yellow perch	YOY	21	0.19
brook silverside	YOY	43	0.40
tubenose goby	YOY	1	0.01
unidentified	YOY	3103	28.73
Total (age–1+)	OLS	4983	46.14
Total (young-of-year)	YOY	4048	37.48

[a] Life stage was designated as "YOY" for young-of-year, and "OLS" for other life stages.

[b] There were 108 seine hauls performed in total.

Table 3.—Catch summary for YOY largemouth bass for the 2005 index fishing survey.

Site	Group	Week 1	2	3	4	5	6	7	8	CUE
Mitchell's Bay inside	Northeast				34	2	19	10		8.13
Mitchell's Bay outside	Northeast				8		13	7	15	3.91
St. Luke Club	Northeast			25	48	1	5	1	6	8.60
Bradley's Marsh	East				2	6	1	7	5	2.10
Laforet's Beach	East			2	41	5	40	32	4	8.86
Peter Street	East			231	14	12	21	30	3	22.21
Belle River east	West				1				1	0.15
Belle River west	West			21		5		3	4	2.36
Puce River	West					2	4	2	2	0.71

Table 4.—Catch summary for YOY smallmouth bass for the 2005 index fishing survey.

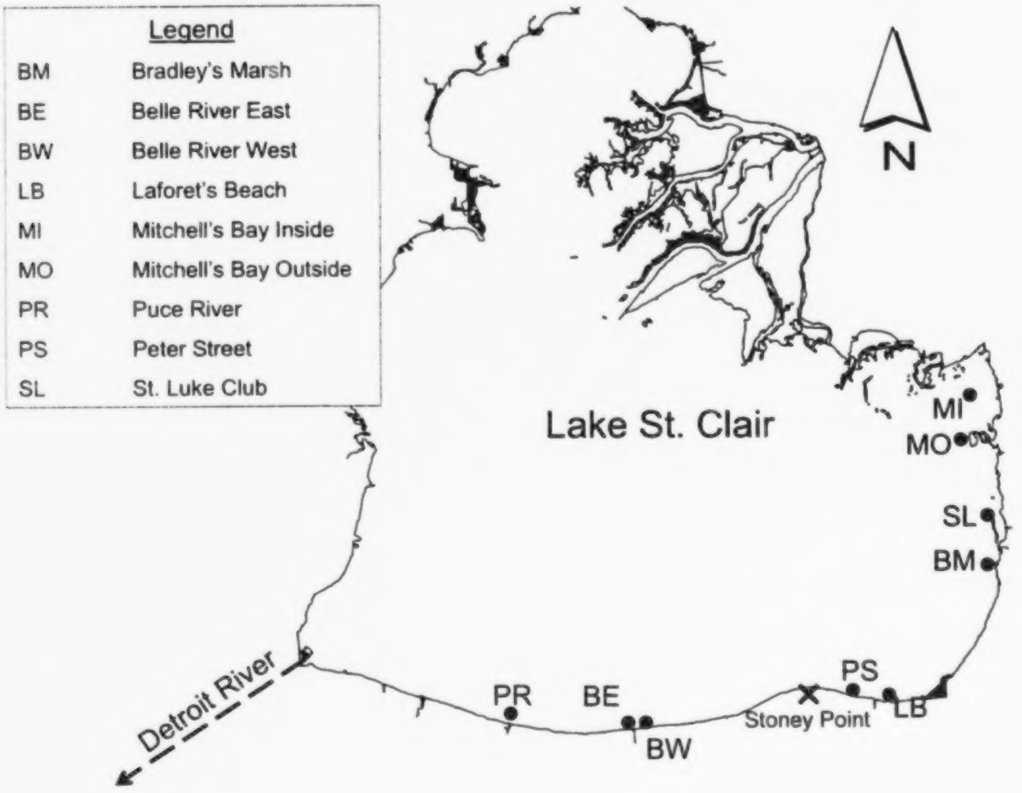
Site	Group	Week 1	2	3	4	5	6	7	8	CUE
Mitchell's Bay inside	Northeast				8	5	3			2.00
Mitchell's Bay outside	Northeast				6	1	3	2		1.09
St. Luke Club	Northeast			3	67	3	8	2		8.30
Bradley's Marsh	East			1	14	5	4		1	2.50
Laforet's Beach	East					1	6		2	0.64
Peter Street	East				1	4		5		0.71
Belle River east	West						17	2	3	1.69
Belle River west	West			1						0.07
Puce River	West								7	0.50

Table 5.—Catch summary for YOY yellow perch for the 2005 index fishing survey.

		Week								
Site	Group	1	2	3	4	5	6	7	8	CUE
Mitchell's Bay inside	Northeast									
Mitchell's Bay outside	Northeast									
St. Luke Club	Northeast									
Bradley's Marsh	East			1	1	2				0.40
Laforet's Beach	East			4			1		1	0.43
Peter Street	East								1	0.07
Belle River east	West				1					0.08
Belle River west	West			1		2		1		0.29
Puce River	West			1			4			0.36

Table 6.—Catch rates (number of fish per seine haul) for YOY index sampling conducted in 2005 and 1996.

Site	Group	Year	Smallmouth bass	Largemouth bass	Yellow perch	Walleye
Mitchell's Bay inside	Northeast	2005	2.00	8.13		
Mitchell's Bay inside	Northeast	1996	1.72	0.17	0.89	4.67
Mitchell's Bay outside	Northeast	2005	1.09	3.91		
Mitchell's Bay outside	Northeast	1996	0.28	2.22	1.11	0.06
St. Luke Club	Northeast	2005	8.30	8.60		
St. Luke Club	Northeast	1996		238.50	4.17	
Bradley's Marsh	East	2005	2.50	2.10	0.40	
Bradley's Marsh	East	1996	1.76	2.17	0.43	
Laforet's Beach	East	2005	0.64	8.86	0.43	
Laforet's Beach	East	1996	1.82	0.87		
Peter Street	East	2005	0.71	22.21	0.07	
Peter Street	East	1996	0.12	4.43	0.45	
Belle River east	West	2005	1.69	0.15	0.08	
Belle River east	West	1996	0.00	3.17	1.11	
Belle River west	West	2005	0.07	2.36	0.29	
Belle River west	West	1996	0.00	0.13	0.06	
Puce River	West	2005	0.50	0.71	0.36	
Puce River	West	1996	0.06	0.30	0.18	
Total		2005	1.71	6.44	0.19	
Total		1996	0.48	61.00	0.05	0.08



Legend
BM Bradley's Marsh
BE Belle River East
BW Belle River West
LB Laforet's Beach
MI Mitchell's Bay Inside
MO Mitchell's Bay Outside
PR Puce River
PS Peter Street
SL St. Luke Club
N
Lake St. Clair
MI
MO
SL
BM
PS
LB
Stoney Point
BE
BW
PR
Detroit River

Figure 1.—Names and locations (approximate) of the 2005 young-of-year sampling sites.

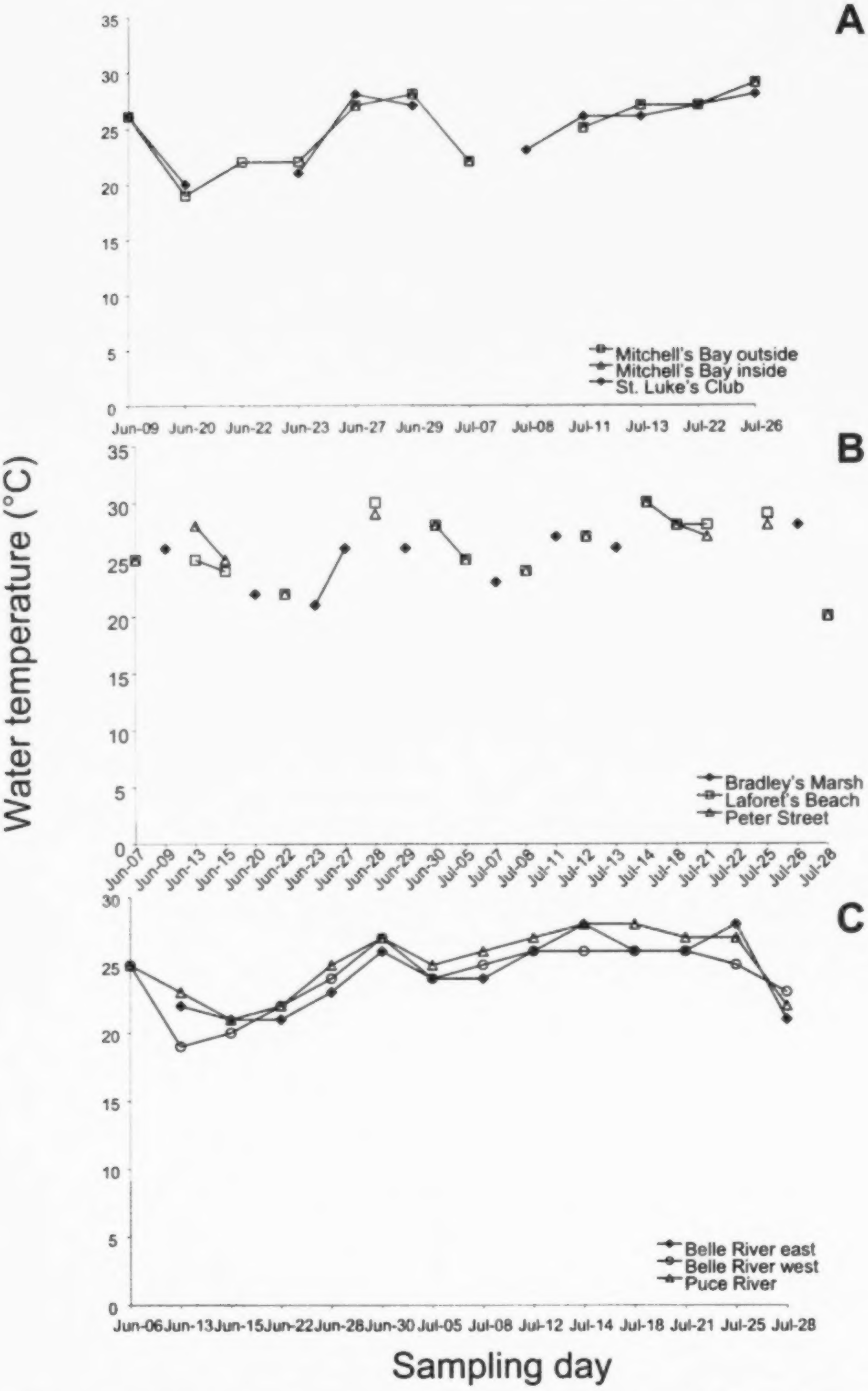


Figure 2.—Water temperatures at sampling stations northeast (A), east (B) and west (C) of Stoney Point, in Lake St. Clair.

Appendix 1.—Catch summaries for all fish species for each sampling site, 2005.

Fish species	Life stage	Total catch	CUE
	Bradley Marsh		
silver redhorse	OLS	1	0.10
emerald shiner	OLS	8	0.80
spottail shiner	OLS	399	39.90
spotfin shiner	OLS	2	0.20
mimic shiner	OLS	7	0.70
bluntnose minnow	OLS	50	5.00
banded killifish	OLS	33	3.30
yellow perch	OLS	2	0.20
logperch	OLS	1	0.10
brook silverside	OLS	77	7.70
unidentified	OLS	114	11.40
smallmouth bass	YOY	25	2.50
largemouth bass	YOY	21	2.10
yellow perch	YOY	4	0.40
unidentified	YOY	103	10.30
Total	OLS	694	69.40
Total	YOY	153	15.30
	Belle River East		
longnose gar	OLS	2	0.15
gizzard shad	OLS	41	3.15
eastern silvery minnow	OLS	2	0.15
emerald shiner	OLS	6	0.46
spottail shiner	OLS	184	14.15
mimic shiner	OLS	69	5.31
white perch	OLS	1	0.08
white bass	OLS	2	0.15
logperch	OLS	3	0.23
brook silverside	OLS	136	10.46
white perch	OLS	1	0.08
white bass	OLS	3	0.23
yellow perch	OLS	3	0.23
unidentified	OLS	303	23.31
smallmouth bass	YOY	22	1.69
largemouth bass	YOY	2	0.15
yellow perch	YOY	1	0.08
unidentified	YOY	19	1.46
Total	OLS	756	58.15
Total	YOY	44	3.38

Fish species	Life stage	Total catch	CUE
Belle River West			
longnose gar	OLS	2	0.14
gizzard shad	OLS	6	0.43
emerald shiner	OLS	42	3.00
spottail shiner	OLS	179	12.79
mimic shiner	OLS	520	37.14
bluntnose minnow	OLS	23	1.64
banded killifish	OLS	2	0.14
white perch	OLS	1	0.07
bluegill	OLS	2	0.14
yellow perch	OLS	2	0.14
brook silverside	OLS	160	11.43
tubenose goby	OLS	1	15.07
unidentified	OLS	211	0.07
smallmouth bass	YOY	1	0.07
largemouth bass	YOY	33	2.36
yellow perch	YOY	4	0.29
unidentified	YOY	124	8.86
Total	OLS	1151	82.21
Total	YOY	162	11.57
Laforet's Beach			
common carp	OLS	3	0.21
bluntnose minnow	OLS	4	0.29
banded killifish	OLS	21	1.50
rock bass	OLS	2	0.14
pumpkinseed	OLS	23	1.64
bluegill	OLS	50	3.57
yellow perch	OLS	1	0.07
logperch	OLS	1	0.07
brook silverside	OLS	201	14.36
round goby	OLS	1	0.07
tubenose goby	OLS	1	0.07
smallmouth bass	YOY	9	0.64
largemouth bass	YOY	124	8.86
yellow perch	YOY	6	0.43
brook silverside	YOY	43	3.07
tubenose goby	YOY	1	0.07
unidentified	YOY	113	8.07
Total	OLS	308	22.00
Total	YOY	296	21.14

Fish species	Life stage	Total catch	CUE
Mitchell's Bay Inside			
quillback	OLS	3	0.38
common carp	OLS	1	0.13
emerald shiner	OLS	12	1.50
spottail shiner	OLS	112	14.00
mimic shiner	OLS	2	0.25
bluntnose minnow	OLS	4	0.50
banded killifish	OLS	1	0.13
largemouth bass	OLS	5	0.63
logperch	OLS	3	0.38
brook silverside	OLS	5	0.63
smallmouth bass	YOY	16	2.00
largemouth bass	YOY	65	8.13
Total	OLS	148	18.50
Total	YOY	81	10.13
Mitchell's Bay Outside			
eastern silvery minnow	OLS	53	4.82
emerald shiner	OLS	66	6.00
spottail shiner	OLS	85	7.73
mimic shiner	OLS	16	1.45
bluntnose minnow	OLS	37	3.36
banded killifish	OLS	27	2.45
johnny darter	OLS	1	0.09
logperch	OLS	1	0.09
brook silverside	OLS	15	1.36
tubenose goby	OLS	3	0.27
unidentified	OLS	14	1.27
smallmouth bass	YOY	12	1.09
largemouth bass	YOY	43	3.91
unidentified	YOY	200	25.00
Total	OLS	318	28.91
Total	YOY	255	23.18
Puce River			
longnose gar	OLS	1	0.07
alewife	OLS	7	0.50
gizzard shad	OLS	47	3.36
quillback	OLS	1	0.07
golden redhorse	OLS	1	0.07
emerald shiner	OLS	295	21.07
spottail shiner	OLS	417	29.79
spotfin shiner	OLS	1	0.07
sand shiner	OLS	2	0.14
mimic shiner	OLS	57	4.07
bluntnose minnow	OLS	30	2.14

Fish species	Life stage	Total catch	CUE
Puce River—continued			
fathead minnow	OLS	1	0.07
blacknose dace	OLS	15	1.07
white perch	OLS	40	2.86
white bass	OLS	8	0.57
bluegill	OLS	8	0.57
largemouth bass	OLS	2	0.14
yellow perch	OLS	18	1.29
logperch	OLS	1	0.07
brook silverside	OLS	84	6.00
round goby	OLS	4	0.29
tubenose goby	OLS	1	0.07
unidentified	OLS	200	14.29
smallmouth bass	YOY	7	0.50
largemouth bass	YOY	10	0.71
yellow perch	YOY	5	0.36
unidentified	YOY	2	0.14
Total	OLS	1241	88.64
Total	YOY	24	1.71
Peter Street			
spottail shiner	OLS	198	14.14
spotfin shiner	OLS	4	0.29
mimic shiner	OLS	5	0.36
bluntnose minnow	OLS	13	0.93
silver shiner	OLS	10	0.71
channel catfish	OLS	1	0.07
banded killifish	OLS	5	0.36
white perch	OLS	7	0.50
rock bass	OLS	3	0.21
pumpkinseed	OLS	11	0.79
bluegill	OLS	67	4.79
largemouth bass	OLS	1	0.07
yellow perch	OLS	11	0.79
logperch	OLS	1	0.07
brook silverside	OLS	143	10.21
round goby	OLS	11	0.79
tubenose goby	OLS	2	0.14
smallmouth bass	YOY	10	0.71
largemouth bass	YOY	311	22.21
yellow perch	YOY	1	0.07
unidentified	YOY	1478	105.57
Total	OLS	493	35.21
Total	YOY	1800	128.57

Fish species	Life stage	Total catch	CUE
	St. Luke Club		
white sucker	OLS	1	0.10
eastern silvery minnow	OLS	1	0.10
spottail shiner	OLS	134	13.40
mimic shiner	OLS	22	2.20
bluntnose minnow	OLS	6	0.60
channel catfish	OLS	1	0.10
banded killifish	OLS	29	2.90
pumpkinseed	OLS	2	0.20
smallmouth bass	OLS	100	10.00
largemouth bass	OLS	15	1.50
yellow perch	OLS	51	5.10
johnny darter	OLS	1	0.10
logperch	OLS	4	0.40
brook silverside	OLS	7	0.70
unidentified	OLS	400	40.00
smallmouth bass	YOY	83	8.30
largemouth bass	YOY	86	8.60
unidentified	YOY	164	16.40
Total	OLS	774	77.40
Total	YOY	333	33.30

Lower Thames River Larval Walleye Index Survey, 2004–2005

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Introduction

Historically, the Thames River was the primary spawning area for walleye inhabiting Lake St. Clair (Goodyear et al. 1982). Tagging data indicates that walleye from the Lake St. Clair stock move into Lakes Huron and Erie, thus Thames River stock potentially contributes individuals to both Lake Huron and Lake St. Clair populations (Todd & Haas, 1993). Assessments of the Thames River walleye stock status in the early 1990s concluded that walleye population size was at that time only a fraction of historic levels and that the decreasing trend in Thames River walleye stock size was expected to continue to decrease for the remainder of the decade (MacLennan, 1992). In 1992, a larval walleye index survey was performed as a means of assessing the production of walleye in the river. The index survey was repeated annually until 1996.

In order to assess the current larval production of the Thames River walleye stock, larval index surveys resumed in 2004 and were repeated in 2005. The results of the index trawling were compared to trawling data collected between 1992 and 1996.

Methods

The upstream boundary of the survey area was Jeannette's Creek (Figure 1). The downstream boundary was the mouth of the Thames River at Lake St. Clair. Daily sampling started at the downstream end of the survey area and proceeded toward the upstream end. Sampling was performed during daylight hours, with most sampling (>90%) completed before midday.

The sampling gear was plankton net (diameter of 0.5 m) with 500μm mesh in the cod end. All tows were pulled mid-channel and in an upstream direction. The net was towed just below the surface. All trawls were 10 minutes in duration. Towing speed was adjusted to keep the gear at the proper height, with a modal speed of 0.7 m/s. Prior to towing the plankton net, water temperature (°C), water clarity (Secchi depth in metres), and current speed were recorded. There were six tows performed each day in 2004, and seven tows per day in 2005.

Observation of adult walleye in the Thames River indicated when spawning was finished. When this point was reached, larval sampling was started. As walleye spawn in waters with a temperature range of 5.6° to 11° C, sampling was started when the temperature of the Thames River water was within this range.

Contents of each trawl were preserved in formalin and stored for future identification. In the laboratory, larval fishes were identified using Auer (1982). Individual fishes were measured for total length (TL, mm). The counts of larval fishes were used to calculate daily catch per unit effort (CUE) which was converted to density measurements for each day of the survey.

Results

2004

Water temperature over the 20044 survey increased at an average rate of 0.3°C per day (Figure 2A). The temperature on the final day of sampling was 18°C. Water clarity was initially 0.3 m on April 23 and April 26, 2005. After April 26, water clarity was constantly measured at 0.2 m for all sites (Figure 2B).

The index survey in 2004 recorded 103 larval walleye and 559 other fishes (Table 1). Larval walleye were observed throughout the 2004 survey, and were collected on all but two sampling days. Catch rates of larval walleye peaked on April 28, 2004, translating to a density of 58 fish per thousand cubic meter (Table 2). The mean CUE was 1.3 fish per tow for the entire 2004 survey.

Other fish species collected during the 2004 survey were white sucker, trout perch, and logperch, which each have comparable spawning temperatures (~10°C) to walleye (Table 3). White sucker larvae were only observed on May 10, 2004. Trout perch larvae were observed from May 4, 2004 until the end of the survey. Logperch larvae were observed from April 29, 2004 until the end of the survey.

2005

Water temperature of the Thames River increased at an average rate of 0.6°C per day until May 31, 2005 (Figure 3A). After May 31, water temperatures remained steady at 20°C for all sites. Water clarity in the Thames River varied over the 2005 survey period, with a mean value of 0.55 m (Figure 3B).

While no walleye larvae were collected in the 154 tows performed in 2005, there were 5929 other fishes collected (Table 4). The species observed in the 2005 survey were white sucker, trout perch, logperch, and gizzard shad (Table 5). White sucker larvae were only observed on May 19, 2005. Trout perch larvae were only observed on the first day of sampling, May 3, 2005. Logperch larvae were the most abundant species during the 2005 survey, with a maximum density of over 35,000 fish per thousand cubic meter observed on May 20, 2005. Mean density of logperch across the survey period (as logperch were observed throughout the 2005 survey period) was 4512 (± 2011 standard error) fish. Gizzard shad larvae were first observed on May 24, 2005. Onward from May 27, 2005 gizzard shad larvae continued to be captured in the plankton net until the end of the 2005 survey on June 3, 2005.

Comparison of 2004 survey estimates to 1992–1996 estimates

Catch rates of larval walleye from the index surveys of 1992–1996 reveal that larval catch rates varied from year to year (Figure 4A). Larval walleye catch rates peaked in 1994, when the mean CUE for the survey period was 32 larvae per tow. After 1994, CUEs decreased to less than one walleye larvae per tow.

Larval walleye catch rates from 2004 in the Thames River were higher than catch rates from 1995 and 1996, the final index survey years during the 1990s (Kruskal-Wallace test statistic = 7.456, p = 0.024, Figure 4B). When considering all available data, although the 2004 index data shows an increase in mean catch rate over 1995 and 1996, the mean catch rate for 2004 was still 95.8% lower than the 1994 mean catch rate and 87.6% lower than the mean catch rate for the entire series of index surveys during the 1990s.

Discussion

Walleye recruitment from year to year is highly variable in many systems, so fluctuations in the CUE of walleye observed in the Thames River index surveys are expected, yet the failure to detect any walleye larvae in 2005 is a disturbing observation. Should further annual assessments fail to detect walleye larvae, the vitality of the Thames River stock would have to be called into question.

The low abundance of larvae in 2004 indicates that annual production of the Thames River walleye stock is decreasing. Since adult walleye from the Lake St. Clair stock are known to travel extensively during non-spawning months of the year (Todd and Haas, 1993) factors that affect adult walleye are less likely to be the cause of the decline in the breeding success of the Thames River walleye stock. A potential cause of the decline in production could be reduced survivorship of eggs and larvae. In a study of Thames River walleye, Flood and Lee (1996) observed that walleye eggs and larvae reared in water from the lower portion of the Thames River (below the city of London, Ontario) had lower hatchability and final survival levels. While no single chemical was found to cause the difference in walleye survivorship, there was a difference in water quality between Thames River and one control site above the city of London. In order to determine the nature and extent of this issue, future toxicology studies should occur.

Acknowledgements

The identification of larval specimens in the laboratory was done by Connie Iserman. Data entry was completed by Debbie Warner. Field collection was accomplished in cooperation with the Chippewa of the Thames, and the Anishinabek Fisheries Resource Centre. We thank Kim Carmichael for helping with coordination, and Lawrence Sturgeon, and James Elm for all of their hard work in the field.

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Table 1.—River condition, survey intensity, and total catch of fishes during the larval walleye index survey in the lower Thames River in 2004.

Date	Julian day	Water temperature (°C)	Secchi depth (m)	Number of tows	Total catch of larval walleye	Total catch of other larval fish species
23 April	114	13	0.3	6	1	0
26 April	117	13	0.3	6	13	0
27 April	118	12	0.2	6	14	0
28 April	119	11	0.2	6	29	0
29 April	120	12	0.2	6	10	18
30 April	121	13	0.2	6	25	44
3 May	124	11	0.2	6	2	32
4 May	125	11	0.2	6	0	52
5 May	126	12	0.2	6	3	23
6 May	127	13.5	0.2	6	0	18
7 May	128	13	0.2	6	2	36
10 May	131	14.5	0.2	6	2	308
17 May	138	18	0.2	6	2	28
Total					103	559

Table 2.— Number of larval walleye collected in each ten minute plankton net tow in the lower Thames River between April 23 and May 17, 2005.

		Tows								
Date	Julian day	1	2	3	4	5	6	Total catch	CUE (fish/tow)	Density (fish/m^3 × 10^3)
23 April	114	1	0	0	0	0	0	1	0.2	2.0
26 April	117	2	6	3	0	0	2	13	2.2	23.0
27 April	118	4	2	0	1	2	5	14	2.3	34.0
28 April	119	7	10	5	1	4	2	29	4.8	58.6
29 April	120	2	2	3	2	1	0	10	1.7	20.2
30 April	121	11	4	4	1	3	2	25	4.2	50.5
3 May	124	1	0	0	0	1	0	2	0.3	4.0
4 May	125	0	0	0	0	0	0	0	0	0
5 May	126	0	3	0	0	0	0	3	0.5	6.1
6 May	127	0	0	0	0	0	0	0	0	0
7 May	128	1	0	0	0	1	0	2	0.3	4.0
10 May	131	0	0	0	2	0	0	2	0.3	4.0
17 May	138	1	0	0	0	1	0	2	0.3	4.0
Total								103		
Average									1.3	16.2

Table 3.—Catch per unit effort (CUE, fish per ten minute tow) and density of other fish species captured during the larval walleye index survey in the lower Thames River, April 23–May 7, 2004.

		Species CUE (fish/tow)			Density (fish/m^3 × 10^3)		
Date	Julian day	White sucker	Trout perch	Logperch	White sucker	Trout perch	Logperch
23 April	114	0	0	0	0	0	0
26 April	117	0	0	0	0	0	0
27 April	118	0	0	0	0	0	0
28 April	119	0	0	0	0	0	0
29 April	120	0	0	3.0	0	0	36.4
30 April	121	0	0	7.3	0	0	88.9
3 May	124	0	0	5.3	0	0	64.7
4 May	125	0	0.7	8.0	0	8.1	97.0
5 May	126	0	2.3	1.5	0	28.3	18.2
6 May	127	0	2.7	0.3	0	32.3	4.0
7 May	128	0	5.7	0.3	0	68.7	4.0
10 May	131	1.3	16.2	33.8	16.2	196.0	410.3
17 May	138	0	4.3	0.3	0	52.5	4.0

Table 4.—River condition, survey intensity, and total catch of fishes during the larval walleye index survey in the lower Thames River in 2005.

Date	Julian day	Water temperature (°C)	Secchi depth (m)	Number of tows	Total catch of larval walleye	Total catch of other larval fish species
3 May	123	8	0.6	7	0	10
4 May	124	8	0.6	7	0	3
5 May	125	6	0.7	7	0	4
6 May	126	7	0.7	7	0	20
9 May	129	12	0.6	7	0	6
10 May	130	12	0.5	7	0	43
11 May	131	14	0.5	7	0	102
12 May	132	12	0.5	7	0	325
13 May	133	12	0.5	7	0	321
16 May	136	12	0.5	7	0	1046
18 May	138	15	0.5	7	0	170
19 May	139	14	0.5	7	0	1554
20 May	140	15	0.4	7	0	2066
24 May	144	14	0.4	7	0	106
25 May	145	14	0.4	7	0	19
26 May	146	17	0.5	7	0	8
27 May	147	17	0.6	7	0	11
30 May	150	20	0.6	7	0	25
31 May	151	20	0.65	7	0	17
1 June	152	20	0.7	7	0	24
2 June	153	20	0.5	7	0	12
3 June	154	20	0.6	7	0	37
Total				154		5929

Table 5.—Catch per unit effort (CUE, fish per ten minute tow) and density of other fish species captured during the larval walleye index survey in the lower Thames River, April 23–June 3, 2005.

		Species CUE (fish/tow)				Density (fish/m^3 × 10^3)			
Date	Julian day	Gizzard shad	White sucker	Trout perch	Logperch	Gizzard shad	White sucker	Trout perch	Logperch
3 May	123	0.6	0	0.7	0.1	67.9	0	84.9	17.0
4 May	124	0	0	0	0.4	0	0	0	50.9
5 May	125	0	0	0	0.6	0	0	0	67.9
6 May	126	0	0	0	2.9	0	0	0	339.5
9 May	129	0	0	0	0.9	0	0	0	101.9
10 May	130	0	0	0	6.1	0	0	0	730.0
11 May	131	0	0	0	14.6	0	0	0	1731.6
12 May	132	0	0	0	46.4	0	0	0	5517.4
13 May	133	0	0	0	45.9	0	0	0	5449.5
16 May	136	0	0	0	149.4	0	0	0	17757.4
18 May	138	0	0	0	24.3	0	0	0	2886.0
19 May	139	0	0.1	0	221.9	0	17.0	0	26364.5
20 May	140	0	0	0	295.1	0	0	0	35073.5
24 May	144	0.1	0	0	15.0	17.0	0	0	1782.5
25 May	145	0	0	0	2.7	0	0	0	322.6
26 May	146	0	0	0	1.1	0	0	0	135.8
27 May	147	0.3	0	0	1.3	34.0	0	0	152.8
30 May	150	1.4	0	0	2.1	169.8	0	0	254.6
31 May	151	1.7	0	0	0.7	203.7	0	0	84.9
1 June	152	2.3	0	0	1.1	271.6	0	0	135.8
2 June	153	0.7	0	0	1.0	84.9	0	0	118.8
3 June	154	3.6	0	0	1.7	424.4	0	0	203.7

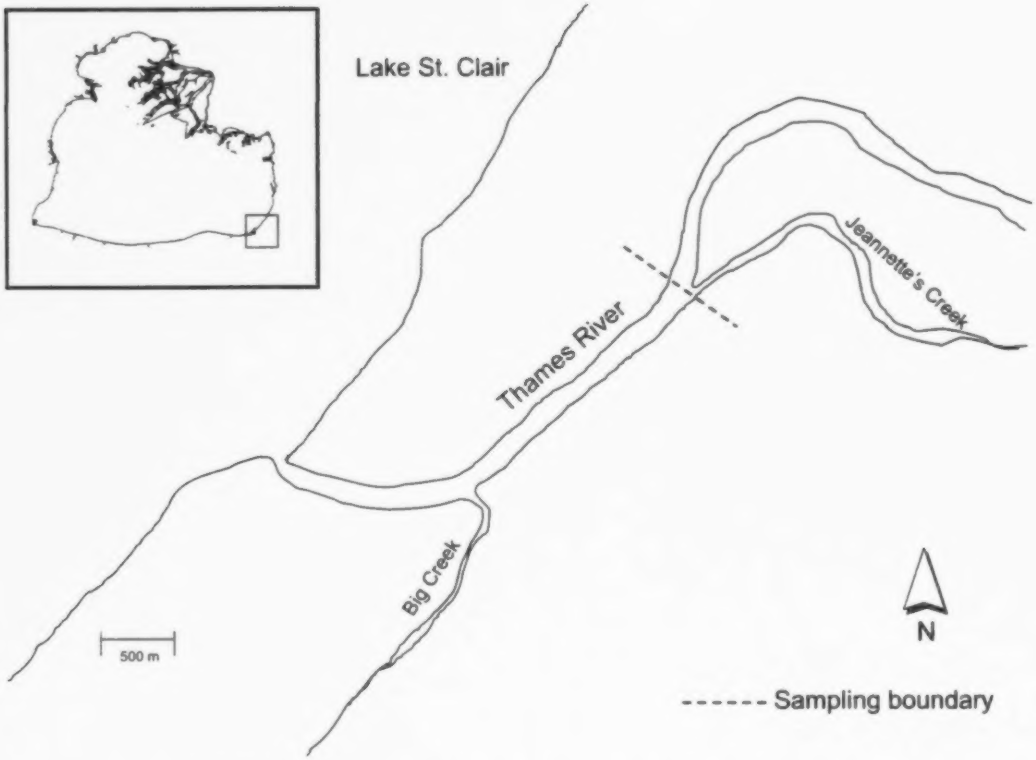
Lake St. Clair
Thames River
Jeannette's Creek
Big Creek
500 m
N
------ Sampling boundary

Figure 1.—Location of 2004 and 2005 larval fish sampling in the lower Thames River.

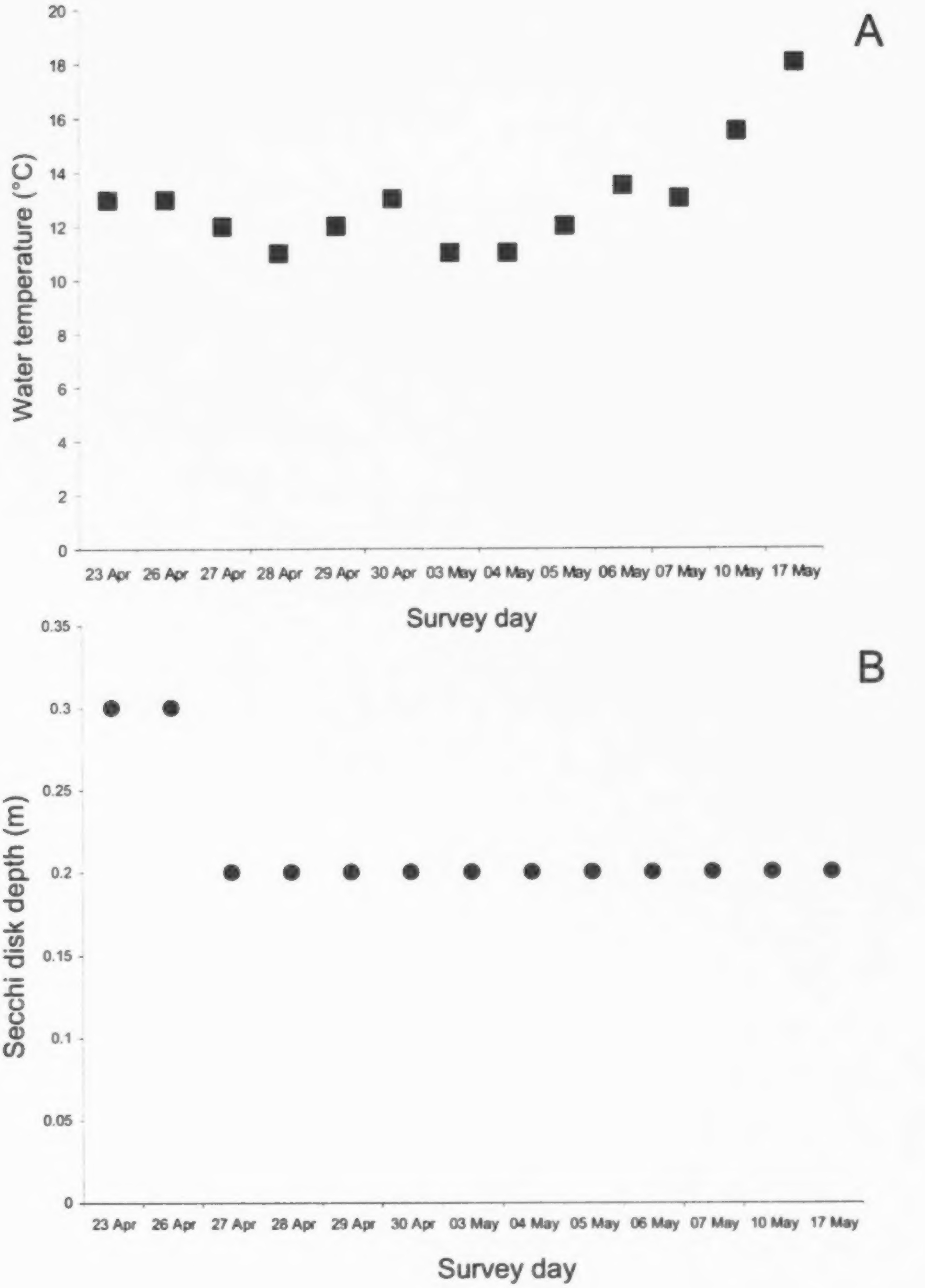

Figure 2.—Water temperatures (A) and water clarity measurements (B) for each day of the 2004 larval walleye index survey on the lower Thames River, Ontario.

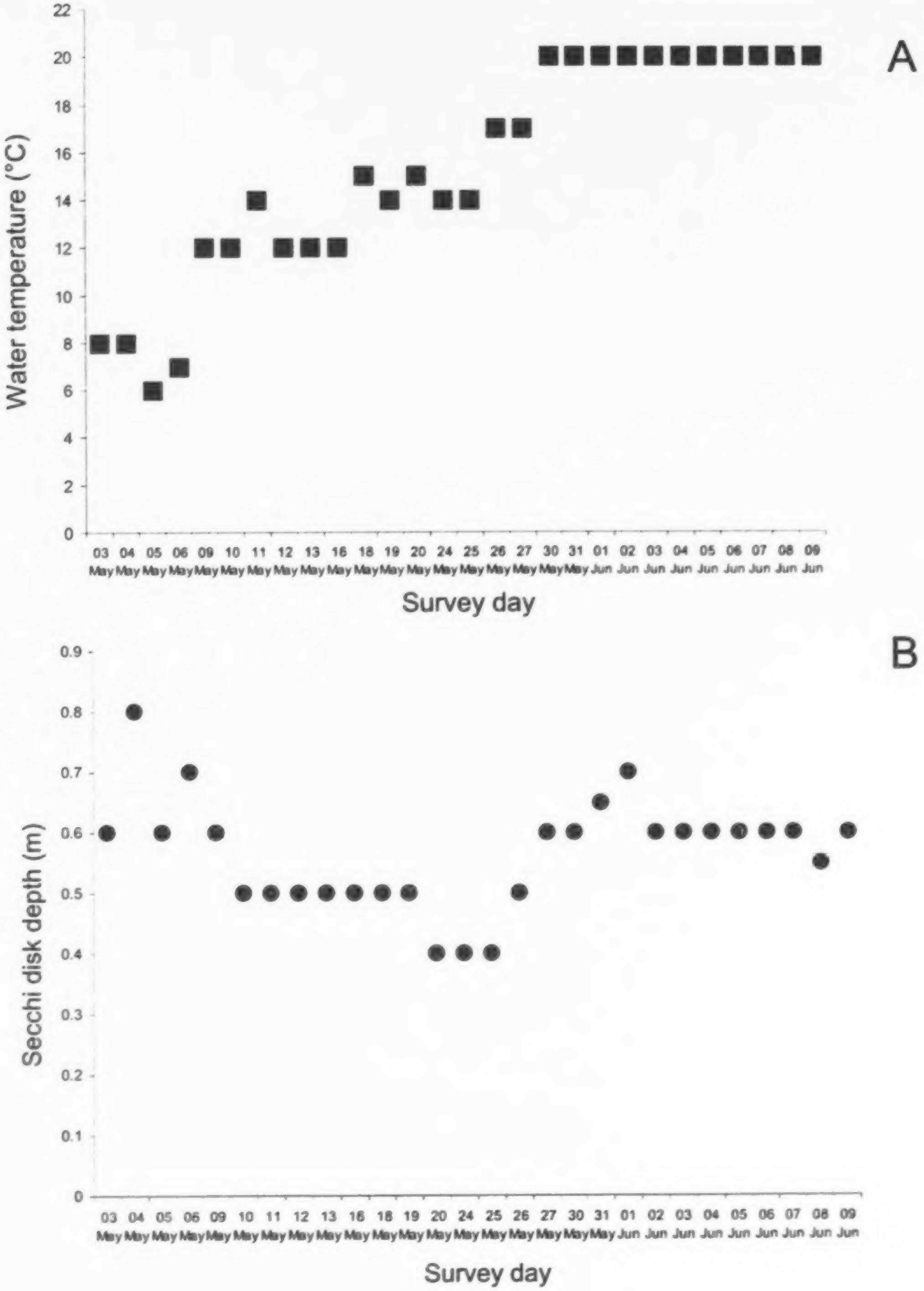

Figure 3.—Water temperatures (A) and water clarity (B) for each day of the 2005 larval walleye index survey on the lower Thames River, Ontario.

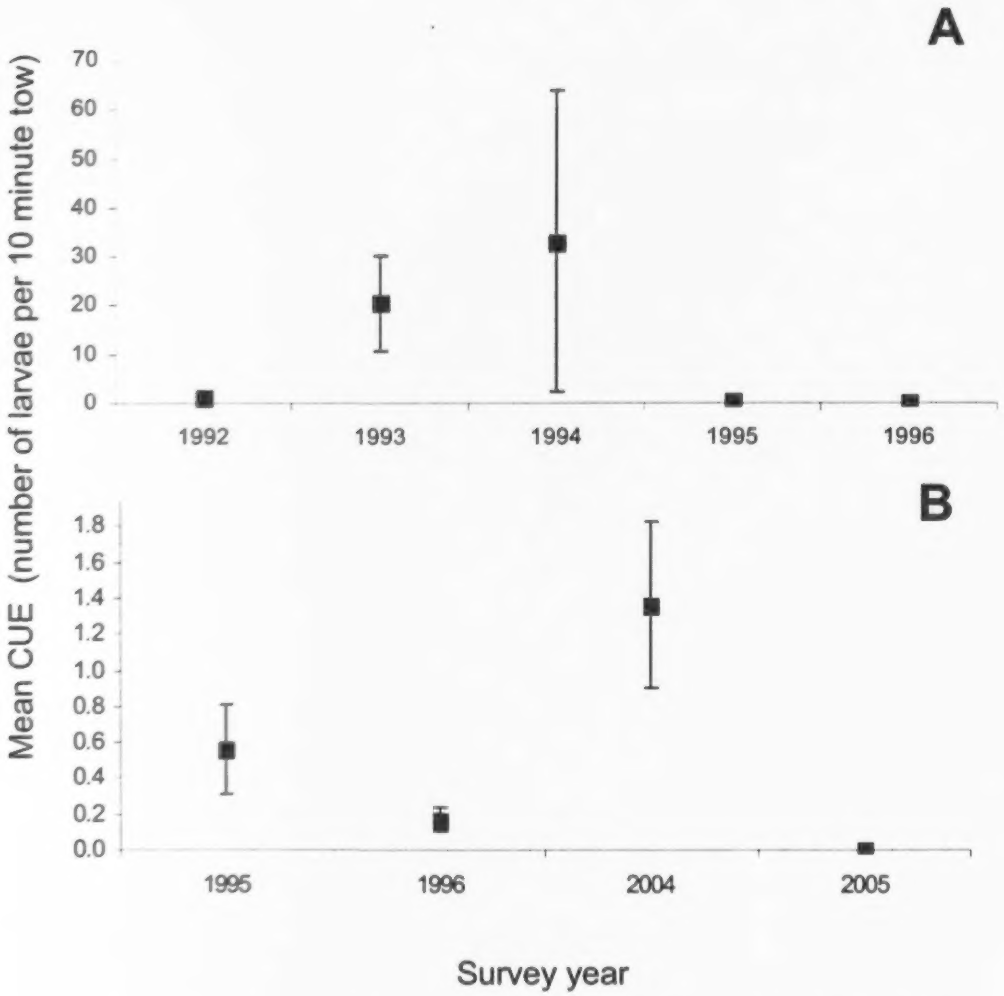

Figure 4.—Average catch per unit effort (CUE) of larval walleye obtained from the Thames River larval index surveys, 1992–1996 (A) and 2004–2005 (B, shown with 1995 and 1996 data). Error bars indicate one standard error about the mean.

CANADA-ONTARIO AGREEMENT RESPECTING THE GREAT LAKES BASIN ECOSYSTEM

THE MINISTRY OF NATURAL RESOURCES

LAKE ERIE BASIN

ANNUAL REPORT

2005 - 2006

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Message from the Chair

My sincerest appreciation to the Lake Erie Management Committee, Lake Erie Technical Team, and project leads for their hard work and dedication in contributing to the shared vision of a "healthy, prosperous and sustainable Great Lakes Basin Ecosystem for present and future generations."

It is with your support that Lake Erie Basin was able to develop and implement a well balanced COA work plan. A work plan that demonstrates MNR's continued ability to work together to protect biodiversity, restore fish and wildlife habitat and their populations and enhance our knowledge of the impacts of ecosystem stress.

Mike Morencie
Lake Manager
Lake Erie Management
Great Lakes Branch

Executive Summary

2005-2006 marks the end of another successful year for MNR's Lake Erie Basin COA program, highlighted by:

- $ 1.574 million in funding to support a well balanced work plan
- Implementing 37 projects across Lake Erie Basin
- Maintaining and/or creating well over 50 partnerships
- Leveraging 3:1 in financial and in-kind support
- Protecting Great Lakes biodiversity by protecting and restoring wetlands and species at risk
- Working with landowners to restore fish and wildlife habitat
- Monitoring populations and assessing the quality of their habitat
- Researching the ecological impacts of invasive species and food-web dynamics

> *"Working together to make progress on restoring the ecological health of the Great Lakes basin"*

Canada-Ontario Agreement
Respecting the Great Lakes Basin Ecosystem

Ontario

Protecting Biodiversity

Protecting Biodiversity is essential if we are to achieve a shared vision of a "healthy, prosperous and sustainable Great Lakes Basin Ecosystem for present and future generations." At its broadest level, biodiversity provides the "ecological services" essential to maintaining human health. A healthy, biologically diverse Great Lakes Basin ecosystem provides the foundation for Ontario's economic and social prosperity. A healthy, diverse Great Lakes fish community supports a recreational fishery representing 25% or $415 million annually towards Canada's sport fishing economy, and a $120 million in yearly revenues from the sale of commercially-harvested fish species.

The Lake Erie COA work plan reflects the importance of protecting biodiversity by contributing $280.0k towards 9 projects that work towards protecting and restoring wetlands and species at risk across Lake Erie basin.

> *Biodiversity refers to the variety of life, as expressed through genes, species, and ecosystems, that is shaped by ecological and evolutionary process."*
>
> Ontario Biodiversity Strategy, 2005

Project Profile: Wetland Drain Project

Historic wetland losses in southern Ontario are estimated at 60-80% with some areas exceeding 95% wetland loss, with 65% of our coastal wetlands converted to other uses. As a result of extensive wetland losses, wetland protection and restoration is a priority for MNR Lake Erie Basin.

Wetland restoration is required to re-establish ecological function and the associated economic, social and cultural well being of Ontario. The most efficient and cost effective solutions is the use of the Drainage Act as a tool to restore surrounding wetlands, without harming agricultural business. The strategy focuses on the use of GIS Technology to overlay the municipal drainage layer with other values to identify suitable sites for restoration to maximize wetland function and benefits to the community. Site selection and feasibility studies are completed in conjunction with municipalities and landowners. With the support of willing landowners and municipalities actions to restore wetland function are incorporated into the Drainage Engineer's report under the Drainage Act.

Results Achieved to date:

- Completed 61 feasibility studies
- Outreach to 524 landowners
- Decommissioned 3 municipal drains
- Restored 42 wetlands
- 1700 m of riparian buffers
- Showcase project for the Temperate Wetland Restoration course

Results:

In 2005-2006 MNR Lake Erie allocated $280.0k

- *$52.8k to protect aquatic species at risk*
- *$228.0k to protect, conserve and restore wetlands*

Restoring Fish and Wildlife Habitat

Habitat loss and degradation is one of the top three stressors that must be addressed to restore Lake Erie. Lake Erie LaMP ecosystem objectives' modeling has shown that land use is a key factor responsible for impairment of Lake Erie. Restoring habitat loss is also a key to de-listing 3 of the 4 Areas of Concern located in the Lake Erie Basin.

MNR COA is working with our stewardship partners and conservation authorities to reach out to landowners across Lake Erie and to assist with knowledge transfer in developing habitat restoration projects and providing access to funding for implementing best management practices.

Results:

$550.0k to support the Stewardship Network and Conservation Authorities' efforts to provide landowners and volunteer associations with technical assistance and financial incentives to plan and implement:

- *Habitat Restoration Projects*
- *Best Management Practices*
- *Reduce nutrient loadings*
- *Address non-point source pollution*

Project Profile: Detroit River Stewardship

The importance of the Detroit River is reflected in its dual designation as both a Canadian and American Heritage River. Defined as a connecting channel in the centre of the international Great Lakes system, it provides a critical link for 8,000 cargo ships a year, and the 65 fish species that travel through the Huron-Erie corridor.

The Detroit River and its watershed is also one of five bi-national Areas of Concern, identified as an environmentally degraded hot spot with impairments to 11 of 14 beneficial uses.

The Detroit River shoreline is characterized by its industrial development, high density urban population centred around the Cities of Detroit and Windsor and the rural agricultural use on the Canadian portion of the river.

The Canard River is one of several tributaries that flow directly into the Detroit River. Although the Canard River is biologically diverse, water quality is considered poor with high loadings of phosphorous and bacteria. The Essex County Stewardship Network has renewed its involvement in cleaning-up the Detroit River by working with a number of landowners and partners to restore habitat and to implement best management practices.

Achievements to date:

- 7 multi-habitat projects initiated
- Creation of 6 wetlands, vernal pools and wet meadow habitat
- One multi-habitat corridor connectivity project
- Outreach to 11 landowners and 2 groups
- 6 reforestation and fence row habitat projects

Restoring Fish and Wildlife Populations

The cause of fish and wildlife population impairments is systemic. Changes in water quality, sediment loadings, loss of habitat and introduction of aquatic invasive species have resulted in shifts in population communities. In terms of historical trends, there is clear evidence that both fish and wildlife populations are impaired as a result of complete loss of species, changes in status of stocks and/or the reduced abundances of a species.

The level of ecological change in Lake Erie is so dramatic that the pre-settlement ecosystem cannot be restored. Alternatively, through the development of management plans, impairment of fish and wildlife communities can be directly measured against a desired state and associated goals and objectives.

Project Profile: Thames River Walleye

One of the the fish community objectives for the St. Clair watershed is "to maintain self-sustaining populations and facilitate use of favourable habitat by top predators such as walleye...."

The Thames River once supported a large walleye spawning migration in the spring. This genetically distinct spawning stock is critical to the maintenance of the Lake St. Clair population, as well as contributing to the St. Clair River, Lake Huron populations and to a lesser extent the Detroit River and Lake Erie West Basin walleye populations.

Today, the Thames River walleye population is severely degraded. Dramatic declines in the Thames River walleye stock began in the mid 1980s, with current assessments indicating that the population continues to decline. The rationale for population decline remains unclear.

Results Achieved to date:

- Intra-Agency work group
- Tag walleye for mark re-capture and survival estimates
- Contaminant analysis
- Evaluate fish community composition / changes in composition
- Abundance of spawning walleye
- Establish baseline population data
- Fall index netting

Results:

MNR Lake Erie COA invested $535.0k in monitoring and assessment of fish and wildlife populations and their habitat for the purposes of:

- *Understanding source(s) of degradation*
- *Recommending actions and strategies to improve degraded populations*
- *Monitoring population response*

Enhancing Knowledge

Science is fundamental to enhaning our knowledge of environmental problems and causes of ecological impairments. Science-based Management, which is a guiding principle of COA, requires the best available science, tools, and information to direct decisions, identify priorities, inform the planning process and guide policy.

MNR research projects have focused on LaMP information needs that clearly identify environmental problems and causes of ecological impairment, with an emphasis on impacts to food-web dynamics and non-native species.

Project Profile: Fisheries Response to Ecosystem Stress

Diet reflects what a predator encounters (it's "energy field"), energy density reflects how that food is utilised, and fecundity reflects one dimension of energy allocation (recruitment). If the diet changes in response to a shift in the prey base (new species through invasion, or loss of species through habitat loss, for example), then less energy may be incorporated in the predator (due to lower quality prey or higher costs to acquire it), leaving less energy available to gonad production. Limited data exists for each of these properties yet substantial changes have been documented (i.e., the only two studies on walleye fecundity showed a dramatic decline in weight-corrected egg production between the early 1970s and early 1990s). We propose to describe seasonal diet, energy density, and fecundity for walleye, yellow perch, white bass, white perch, lake whitefish, steelhead, and burbot. Results will provide a comprehensive baseline data set, and where possible make comparisons to other studies in Lake Erie and elsewhere in the Great Lakes basin.

Results:

In 2005-2006 MNR Lake Erie partnered with Aquatic Research to support three research projects:

- *Support to study botulism across 3 Great Lakes (Huron, Erie, Ontario)*
- *$65.1 k to undertake a fisheries response to ecosystem stress*
- *61.0 k to continue support of Lake Erie LaMP Collaborative Monitoring*

Financial Statement

Project Name and Initiatives	Final Allocation
Lake Erie Basin Coordinator	83.0
Total Planning and Coordination	**83.0**
Distribution, Abundance and Habitat Use by Fowlers Toad on the Lake Erie North Shore	27.0
Ecological Integrity Assessment of Rondeau Bay Wetlands	150.0
Lake Erie LaMP Collaborative Monitoring of Nearshore Areas	61.0
Lake Erie Watersnake Inventory	12.0
Niagara River AOC Fisheries Assessment	100.0
Niagara River AOC Lyon's Creek Watershed Study	20.0
Rondeau Bay Eastern Spiny Softshell Radio Telemetry	5.0
Thames River Fish Community Monitoring	109.9
Thames River Habitat Assessment and Monitoring	10.0
Wetland Evaluations – Guelph District	48.0
Wetland Evaluations – Aylmer District	48.0
Total – Inventory, Monitoring and Assessment	**590.9**
Big Otter Sediment Restoration	20.0
Detroit River Stewardship Initiative	60.0
Grand River Dam Review Committee	5.0
Grand River Ecosystem Multi-Partner Initiative	121.0
Grand River Migratory Fish Committee Support	4.0
Grand River Stewardship Initiatives	70.0
Lower Big Creek Restoration Project	45.0
Lynn River Watershed Restoration	20.0
Niagara River AOC Natural Heritage Linkages	45.0
Norfolk Habitat Restoration Initiatives	45.0
Pelham Hills Golf Course Barrier Removal	10.0
Rondeau Bay Drainage Area Habitat Stewardship Program	35.0
Rondeau Experimental Control of Common Reed for Species at Risk	8.5
Support to St Clair River AOC Stewardship Initiative	45.0
Thames River Demonstration Sub-Watershed	25.0
Thames River Fish Management Plan	20.0
Thames River Habitat Stewardship Initiative	62.0
Thames River Watershed Barrier Assessment	2.5
Wheatley Harbour AOC	20.0
Total – Management of Fish and Wildlife Habitat	**663.0**
Fisheries Response to Ecosystem Stress	65.1
Total Research	**65.1**
Canard River Wetland – General Chemical Property	10.0
Rehabilitation and Creation of Grand River Wetlands	12.0
Sydenham/St Clair River Stewardship Initiative	30.0
Wetland Drain Restoration Project	120.0
Total Wetlands	**172.0**
Total Allocation	**1,574.00**

Canada-Ontario Agreement
Respecting the Great Lakes Basin Ecosystem

Ontario

2003-2004 Lake Erie/Lake St. Clair Angler Attitude Surveys Report

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September, 2006

Abstract

The input of anglers is an important component of decisions made at the Lake Erie Management Unit (LEMU) to manage fisheries in the Lake Erie/Lake St. Clair basin. Angler attitude surveys are frequently used by LEMU to obtain the opinions of anglers who fish locally and provide an opportunity to hear from both avid and occasional anglers. In 2003 and 2004, LEMU conducted a series of angler attitude surveys to obtain a better understanding of the preferred sport fisheries and any differences that may exist between avid, tournament and occasional angler groups. A total of 123 angler attitude surveys were completed. Most anglers lived in southwestern or central Ontario and many had fished Lake Erie/Lake St. Clair before. The preference of anglers for certain species varied depending on the area fished, with smallmouth bass and yellow perch the preferred species for anglers fishing in Long Point Bay; walleye and yellow perch the preferred species for diarists, tournament anglers and anglers fishing in the central basin; and walleye and smallmouth bass the preferred species for anglers fishing in the east basin. Most anglers indicated that they were satisfied with the fishing on Lake Erie/Lake St. Clair and stated that catching fish (either the target species or a few fish) was most important to them. Other responses included spending a nice day out in the company of friends and away from normal activities. Catching large fish and catching lots of fish ranked lower on the list. The majority of respondents said that catching more walleye was more important to them than was having larger walleye. The majority of Long Point Bay anglers said they were happy with the yellow perch fishing, saying that catching larger perch was more important than catching more perch. These anglers were also happy with the smallmouth bass fishing in Long Point Bay, saying catching more bass was more important than having larger bass. Anglers also supported maintaining the current east basin sanctuary areas that protected spawning smallmouth bass.

Introduction

Stakeholder input into management decisions is a critical component of decisions made at the Lake Erie Management Unit (LEMU). There are several ways in which LEMU obtains angler input, each targeting a different segment of the angling population. One way is to discuss the issue with local Ontario Federation of Anglers and Hunters representatives who speak on behalf on the local angling public. A more direct consultation method is to bring issues to anglers at the LEMU's annual Angler Outreach meetings held at a variety of locations across the Lake Erie/Lake St. Clair watershed, and therefore approach anglers who are fairly enthusiastic fishers throughout the basin (e.g., tributary and lake anglers). A different way to obtain angler input is the use of surveys designed to seek opinions from a broad group of anglers that might have differing opinions using Angler Attitude Surveys. These surveys target a subsection of avid and occasional anglers.

In some instances, the questions anglers are asked in the surveys are specific to the issue on which a decision is needed (e.g., changing regulations require specific questions pertinent to management). However, this is not always the case and attitude surveys can be equally as valuable to LEMU if they provide feedback from anglers about general fishing preferences (e.g., preferred species) that can be used to assess angling trends over time.

In 2003 and 2004, LEMU conducted a series of angler attitude surveys to obtain a better understanding of the preferred sport fisheries and any differences that existed between avid, tournament and occasional angler groups. This report summarizes the responses of anglers who completed angler attitude surveys.

Methods

Anglers obtained attitude surveys from one of several sources:

- dockside at the 444 walleye tournament held in Port Colborne, ON (2003),
- from a creel clerk during the east basin access point creel survey (June-August, 2003),
- from a creel clerk during the Long Point Bay roving creel survey (July, 2003 and 2004),
- from a creel clerk during the central basin access point creel survey (June-August, 2004)
- mail out to anglers participating in the Angler Diary Program (2004).

Anglers were encouraged to complete only one attitude survey, however anglers may have completed more than one survey if they were approached in both 2003 and 2004. In general, anglers told staff if they have previously completed a survey, so individual response sheets were considered to be representative of first time responses.

The surveys that were distributed had many identical questions, however there were minor differences designed specifically for the prospective people surveyed. Survey questions mainly asked anglers where they liked to fish, what fish species they preferred, if they were satisfied with the fishing and what they thought of a few of the sport fishing regulations currently in place.

Results and Discussion

A total of 123 angler attitude surveys were completed, however not all participants chose to answer each survey question.

Excluding the surveys that targeted anglers that participate in the Angler Diary Program, anglers were asked if they were diarists. This information helps to identify what proportion of the angling population is represented in the Diary Program. Most anglers (ranging from 89-98% of respondents) were not diarists, indicating that the distribution of attitude surveys to diarists and during regular access point, roving or tournament creel surveys were not targeting the same individual anglers.

Diarists who completed surveys in 2004 were asked how long they had participated in the program. Participation varied from 1 to 24 years, however the average diarist had been a member for 10 years (n=98).

Most anglers originated in southwestern or central Ontario (Table 1). No anglers from eastern or northern Ontario completed surveys in 2003 or 2004. Anglers from southwestern ON make up a substantial proportion of the anglers who were surveyed in the 2003 Long Point Bay Roving Creel, 2004 Central Basin Access Point Creel and 2004 Angler Diarists. Anglers taking part in the 2003 east basin fishery were mainly from southwestern or central Ontario.

Table 1. Location of the primary residences of anglers who completed attitude surveys in 2003 or 2004.

	2003 East Basin Access Point Creel	2003 Long Point Bay Roving Creel	2003 Walleye Tournament	2004 Angler Diarists	2004 Central Basin Access Point Creel
Central Ontario	45%	18%	59%	11%	2%
Toronto				1%	
Southwestern Ontario	48%	79%	19%	88%	88%
Canada		3%	22%		
US	6%			1%	10%

Anglers were asked what areas they fished and many anglers marked more than one location. The responses were grouped into five areas: the Niagara River, the east basin of Lake Erie, the central basin of Lake Erie, the west basin of Lake Erie, and the St. Clair corridor (which includes the St. Clair River, Lake St. Clair and the Detroit River). Anglers who completed surveys in the 2003 east basin access point creel survey mainly fished in the east basin, as did anglers who completed surveys in the 2003 Long Point Bay roving creel (Figure 1). Anglers that were diarists in 2004 or who responded to surveys conducted in the 2004 central basin access point creel survey fished in many areas of the Lake Erie/Lake St. Clair basins (Figure 1). These results were consistent with the results of the 2001 Attitude Survey presented in Cargnelli (2002). Cargnelli reported that Lake Erie anglers fished close to home, with anglers who lived at the east end of Lake Erie fishing mainly in the east basin and anglers who lived in areas adjacent to the central basin fishing in the central basin, but likely to also take fishing trips to the west or east basins.

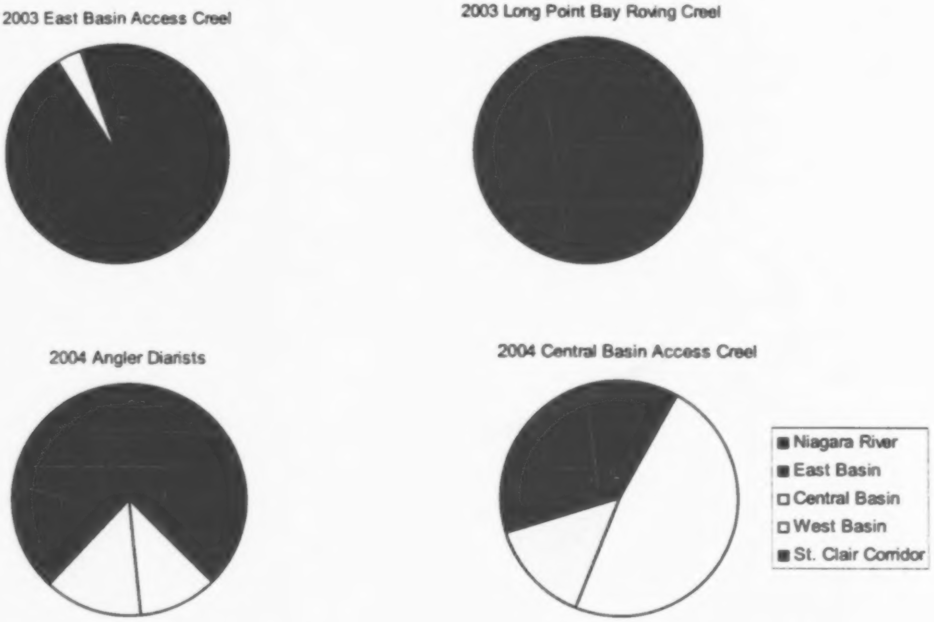

Figure 1. Areas fished by anglers who completed attitude surveys in 2003 and 2004.

Anglers were asked what fish species they preferred to catch, marking more than one species as needed. Species preference did vary depending on the area fished, with smallmouth bass and yellow perch the preferred species for anglers fishing in Long Point Bay; walleye and yellow perch the preferred species for diarists, tournament anglers and anglers fishing in the central basin; and walleye and smallmouth bass the preferred species for anglers fishing in the east basin (Figure 2).

All data were combined to describe the overall species preference for anglers fishing in 2003 and 2004 (Table 2) and this information was used to compare with the species preferences of anglers fishing in 2001 (from Cargnelli, 2002). The results are almost identical with anglers indicating a preference for yellow perch and walleye (24% and 23% of anglers, respectively). The only notable difference in angler preference from 2001 to 2003-2004 was the increased emphasis placed on other trout species (19% in 2003-2004 vs 1% in 2001).

In general, anglers surveyed in 2003 and 2004 reported that they were satisfied with the fishing on Lake Erie/Lake St. Clair. The percent of satisfied anglers ranged from 56-82% (Figure 3). Cargnelli (2002) reported 75% of anglers were satisfied with fishing on Lake Erie in 2001 and 60% were satisfied in a 1998 survey.

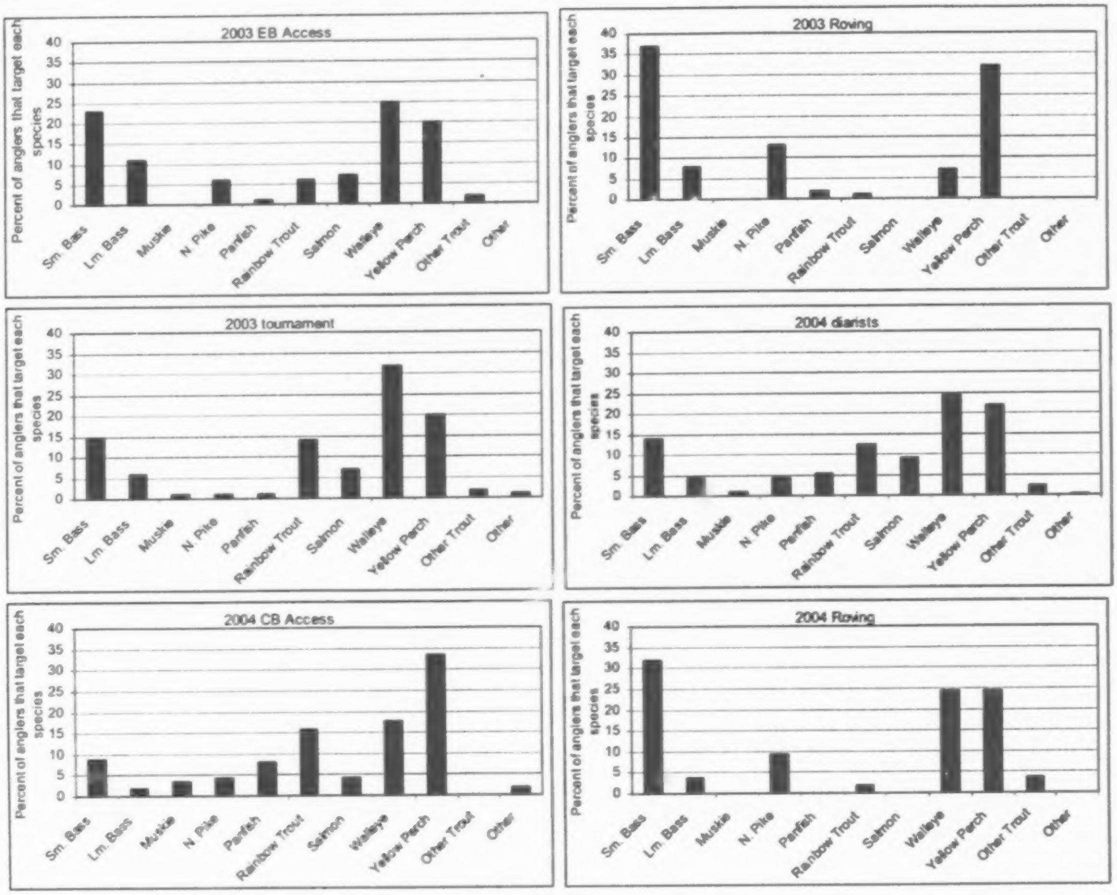

Figure 2. Fish species targeted by anglers who completed attitude surveys in 2003 and 2004, separated by survey.

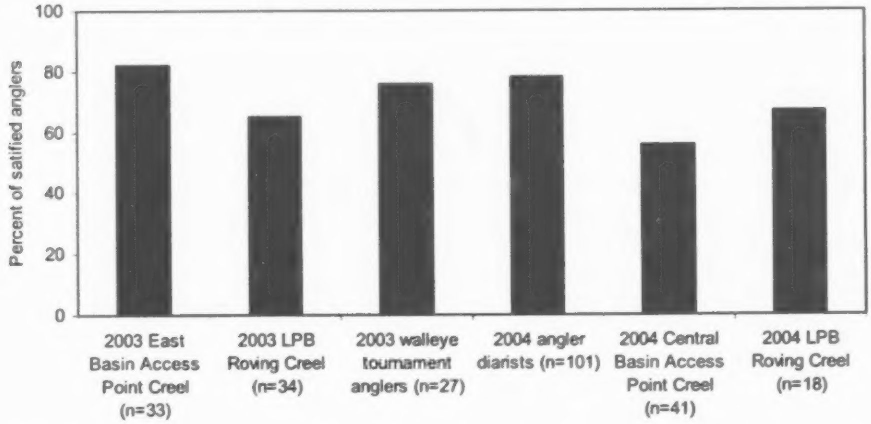

Figure 3. Percent of anglers who completed attitude surveys in 2003 and 2004 who indicated they were satisfied with fishing in the Lake Erie/Lake St. Clair basin.

Table 2. Species preferences, by percent, for all anglers surveyed in 2001 (data from Cargnelli, 2002), and 2003-2004 (data combined from the 2003 east basin access point creel survey, the 2003 and 2004 Long Point Bay roving creel surveys, the 2003 walleye tournament, the 2004 angler diarist survey, and the 2004 central basin access point creel survey). Anglers were asked to select one or more species.

	2001 angler preferences	2003-2004 angler preferences
Yellow perch	24%	24%
Walleye	23%	23%
Smallmouth bass	19%	18%
Rainbow trout	14%	10%
Salmon	6%	6%
Largemouth bass	6%	5%
Northern pike	5%	5%
Panfish	3%	4%
Other trout	1%	19%

Angler satisfaction can be based on any number of factors and survey responses were combined to show what factors were identified as being important to anglers surveyed in different regions of the basin (Figure 4). Leading the list was catching fish: either the target species or a few fish. However, factors such as spending a nice day out in the company of friends and away from normal activities were also identified as being important to anglers. Catching large fish and catching lots of fish ranked lower on the list.

Between 18% and 44% of anglers said they were not satisfied with the local fishing and listed not catching any fish as the primary reason for their dissatisfaction (Figure 5). Other top ranking reasons included not catching the target species, poor weather or water conditions.

A high percentage of anglers reported that they fished Lake Erie/Lake St. Clair the previous year (ranging from 75%-91%), with all anglers saying that this was not their first year fishing in the lake. The 18 anglers interviewed in the Long Point Bay roving creel attitude survey had all fished Lake Erie in the past and these anglers were asked how many years they had been fishing locally. Their responses ranged from 6 to 60 years with an average of 28 years.

To get a better understanding of the activity of local anglers, attitude surveys from the 2003 east basin access point creel, the 2003 walleye tournament, and the 2004 angler diarists asked each angler about the frequency of fishing trips taken. Anglers averaged between 2.5 and 3.7 trips per week (Figure 6).

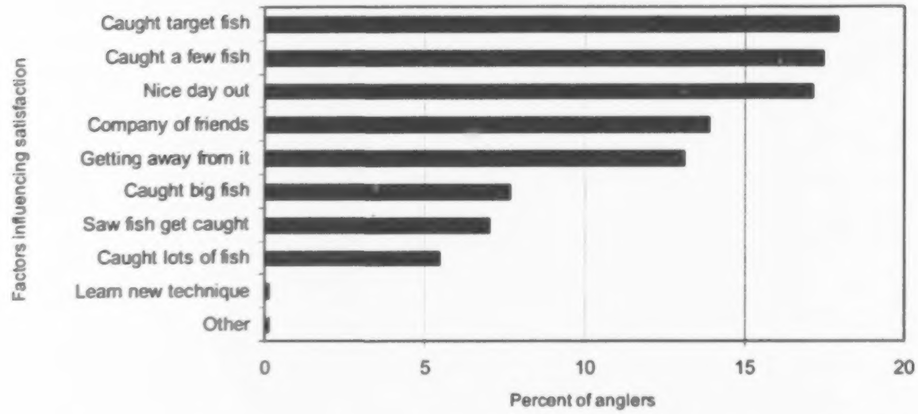

Figure 4. Factors influencing angler satisfaction. Data combined from the 2003 east basin access point creel survey, the 2003 and 2004 Long Point Bay roving creel surveys, the 2003 walleye tournament, the 2004 angler diarist survey, and the 2004 central basin access point creel survey. Anglers were asked to select one or more factors.

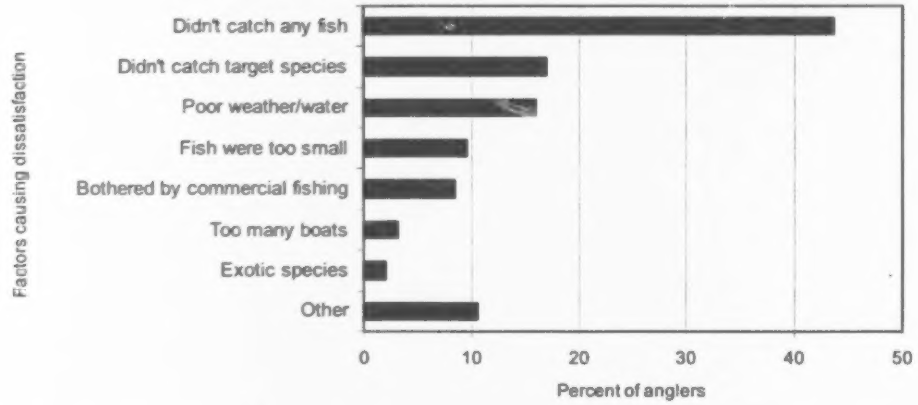

Figure 5. Factors causing anglers to be dissatisfied with fishing. Data combined from the 2003 east basin access point creel survey, the 2003 and 2004 Long Point Bay roving creel surveys, the 2003 walleye tournament, the 2004 angler diarist survey, and the 2004 central basin access point creel survey. Anglers were asked to select one or more factors.

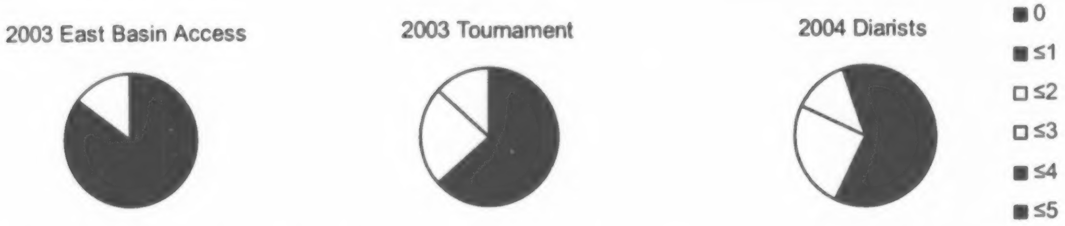

Figure 6. Number of fishing trips taken by anglers who participated in the 2003 east basin access point creel survey (n=27, average number of trips=2.5), the 2003 walleye tournament (n=30, average number of trips=3.3), and the 2004 angler diarist survey (n=76, average number of trips=3.7). Anglers were asked to select only one option.

To get a better understanding of what anglers wanted in a walleye sport fishery, questions were asked specific to what anglers wanted (more walleye or larger walleye) in the fishery and if they would continue to fish for walleye if the daily catch and possession limits were lowered in Lake Erie/Lake St. Clair. At the time of the attitude surveys the limits were 6 walleye per day in the St. Clair corridor and the west and central basins of Lake Erie and 4 walleye per day in the east basin of Lake Erie.

The majority of respondents from the 2003 east basin access point creel survey, the 2004 tournament, the 2004 angler diarist survey and the 2004 central basin access point creel survey said that more walleye was more important to them than was having larger walleye (70-92% preferred more walleye). Only 7-19% of anglers who participated in the 2004 tournament, the 2004 angler diarist survey, and the 2004 central basin access point creel surveys said that they would continue to fish for walleye if limits were lower. In the east basin access point creel survey a higher proportion of anglers, 41%, said they would continue to fish for walleye. This may reflect the fact that there had been low walleye abundance in the east basin in recent years and LEMU and local stakeholder groups had agreed to a 5 year rehabilitation period (2000-2004) that included reduced sport limits and lower commercial allocations.

Long Point Bay roving creel attitude survey

In the 2004 Long Point Bay roving creel attitude survey, anglers were asked a series of questions that related specifically to fishing in the Bay. Twelve anglers all reported that they had not caught a round goby that day, however most anglers said they were concerned about the impact exotic species may have on fishing in Lake Erie and/or Long Point Bay (89%, n=18). When asked to identify the exotic species that were of concern to them, anglers pointed to gobies, zebra mussels and Asian carp.

The ice fishery in Long Point Bay is an active fishery in years when the bay freezes, so anglers were asked if they participated in this ice fishery. Of the 17 anglers who responded to the question, 71% said they did participate, 24% did not, and the remaining 6% indicated that they sometimes took part in this fishery.

Questions specific to the yellow perch fishery were asked to better understand what anglers wanted in this sport fishery. The majority of anglers said they were happy with the yellow perch fishing (78%, n=18) and identified catching larger perch as more important to them than was catching more perch (78% of responses favoured larger fish).

In 2004, when these questions were asked, the yellow perch daily limit was 50 fish, a limit that was supported by 59% of anglers. Only 6% of respondents said that the limit should be higher, while 35% of anglers recommended a daily limit of less than 50 perch.

Long Point Bay is renowned for the smallmouth bass fishery and 88% of anglers surveyed in the 2004 attitude survey stated that they were fishing for this species (the remaining anglers indicated they were fishing for anything). To learn more about what anglers thought about the smallmouth bass regulations, there were four questions specific to this fishery.

Most anglers stated that they were happy with the smallmouth bass fishing in Long Point Bay (72%, n=18) and anglers said having more bass (78%, n=18) was more important than having larger bass. The daily limit of 6 smallmouth bass was supported by 88% (n=17) of anglers with the remaining 12% recommending a limit less than 6. All anglers surveyed were supportive of a closed season for smallmouth bass, however anglers were divided on the timing of the closure with support for the current season, an earlier opening, a later opening, and another time depending on spring conditions (Figure 7).

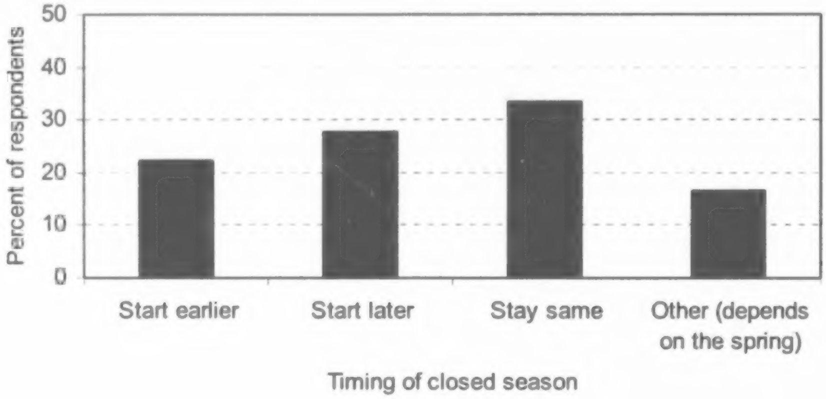

Figure 7. Angler preferences for the smallmouth bass closed season in Lake Erie and Long Point Bay. The 2004 season was closed from December 1 to the last Friday in June in Lake Erie. Responses are from anglers participating in the 2004 Long Point Bay roving creel survey.

Conclusions

Angler opinions are valuable sources of information that are often easily obtained using angler attitude surveys. The information acquired from surveys conducted in 2003 and 2004 indicated:

- most anglers fishing Lake Erie live in southwestern or central Ontario, but local tournaments (e.g., 444 walleye tournament) attract anglers from beyond the region,
- anglers fish throughout Lake Erie, however anglers who fish in Long Point Bay tend not to fish outside the bay,
- yellow perch and walleye are the top two species targeted by anglers fishing Lake Erie,
- in general, anglers are satisfied with Lake Erie fishing and, although catching fish is a main factor contributing to their satisfaction, anglers indicated that they do not need to catch a large fish or lots of fish to be happy,
- anglers indicated that they would prefer to catch more walleye (rather than larger walleye); more smallmouth bass (rather than larger smallmouth bass); and larger yellow perch (rather than more yellow perch),
- Long Point Bay anglers did support a daily catch limit of 50 yellow perch, but many recommended a daily limit of less than 50,
- the majority of Long Point Bay anglers supported a daily limit of 6 bass and all of these anglers were in favour of a closed season for smallmouth bass.

Acknowledgements

Thanks are extended to each angler who took the time to participate in the attitude survey by completing a questionnaire. Erin Arnold, Heather Whitford, Sonya Greenslade, Jake Ruegg, Jotham Dumesnil, April Beard, Elissa Smith, and Alf Marinelli are thanked for their assistance in distributing the attitude surveys. Thanks are also extended to John Cooper for suggestions on earlier drafts of this report.

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2005 Angler Attitude Survey Report on Angling Regulations

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September, 2006

Abstract

Angling fisheries are managed by the Ministry of Natural Resources (MNR) using seasons and catch limits. The area currently managed as Divisions 1 (St. Clair River, Lake St. Clair, Detroit River) and 2 (Lake Erie, upper Niagara River) will be merged to form Fisheries Management Zone 19 in 2007 as part of an initiative that is designed to streamline and modernize the regulations. Angling regulations in place for 2005/2006 in Divisions 1 and 2 needed to be merged in a way that both protects the resource and provides angling opportunities. One very effective way to obtain the input from anglers who fish in Divisions 1 and 2 is to conduct attitude surveys, asking anglers what they think of current regulations and what recommendations they have for regulation changes. The 2005 Angler Attitude Survey was a questionnaire that asked questions specific to regulations on the St. Clair River, Lake St. Clair, Detroit River, Lake Erie, and the upper Niagara River. Completion of the questionnaire was strictly voluntary. Questionnaires were available to anglers at a bait/tackle business in Windsor on the Detroit River, at a bait/tackle business at Long Point on Lake Erie, and from creel clerks during the Lake Erie west basin access point and Inner Long Point Bay roving creel surveys. A total of 145 questionnaires were completed by anglers during June, July and August, 2005. Responses indicated that, for the most part, anglers agreed with the sport regulations in place in Divisions 1 and 2. On Lake Erie, there were some regional differences in responses on smallmouth bass regulations, indicating a west to east gradient in support for a closed season (more support in the east). There were also differences for walleye regulations with anglers in the west more likely to support a limit of 6 walleye than were anglers from the east. Responses were used to help inform Lake Erie Management Unit decisions about sport regulations for 2007.

Introduction

The Ministry of Natural Resources (MNR) uses seasons and catch limits to manage angling fisheries for 18 species on more than 250,000 lakes and thousands of kilometers of rivers and streams throughout Ontario (OMNR, 2005a). Historically, anglers were relatively limited to fishing in areas they could reach using local roads, logging roads, or walking trails, and few regulations were needed. With new opportunities for anglers to reach outstanding fishing in lakes and rivers using planes, all-terrain vehicles (ATVs), and 4-wheel drive trucks, there was a need for additional regulations to be created. Over time, management of angling fisheries became more complicated as exceptions to general regulations were created to address local resource conservation or angler needs.

In addition to being challenging for anglers to understand, regulations put in place for specific reasons on individual lakes were not always effective at managing the resource on a watershed or ecosystem scale. In some cases, regulations established on one lake (e.g., spring closure to protect spawning fish) simply forced anglers to move to an adjacent lake, shifting the angling pressure but not alleviating it.

By 2005, the complex angling regulations in place for the 37 fishing divisions in Ontario were provided to anglers in a regulations booklet that exceeded 80 pages in length. To reduce the complexity of angling regulations, increase fishing opportunities, and enable management of fish resources on a broader landscape level, the angling regulations were reviewed by MNR, Fisheries Section, with the intent to streamline and modernize the regulations for 2007.

In 2007, 20 new Fisheries Management Zones will replace the 37 fishing divisions and have been created based on ecological and social factors such as climate zones, watersheds, fishing pressure and road networks (OMNR 2005a). The new zones provide a clear definition of fishing boundaries for anglers and conservation officers and enable landscape level management. The area currently managed as Divisions 1 (St. Clair River, Lake St. Clair, Detroit River) and 2 (Lake Erie, upper Niagara River) will be merged to form Fisheries Management Zone 19 (see figure 1).

The angling regulations in place for 2005/2006 in Divisions 1 and 2 needed to be streamlined and modernized for 2007. To do this, Lake Erie Management Unit (LEMU) staff used the species tool kits developed by Fisheries Section, information about the status of fish populations and current local angling practices, as well as input from stakeholders and anglers.

One very effective way to obtain the input from anglers who fish in Divisions 1 and 2 was to conduct attitude surveys, asking anglers what they think of current regulations and what recommendations they have for changes to regulations. It also provided an opportunity for staff to interact with anglers and inform them of the imminent changes to angling regulations throughout Ontario.

This report summarizes the input obtained from anglers about the fishing regulations in the waters of Divisions 1 and 2 using the 2005 Lake Erie Angler Attitude Survey.

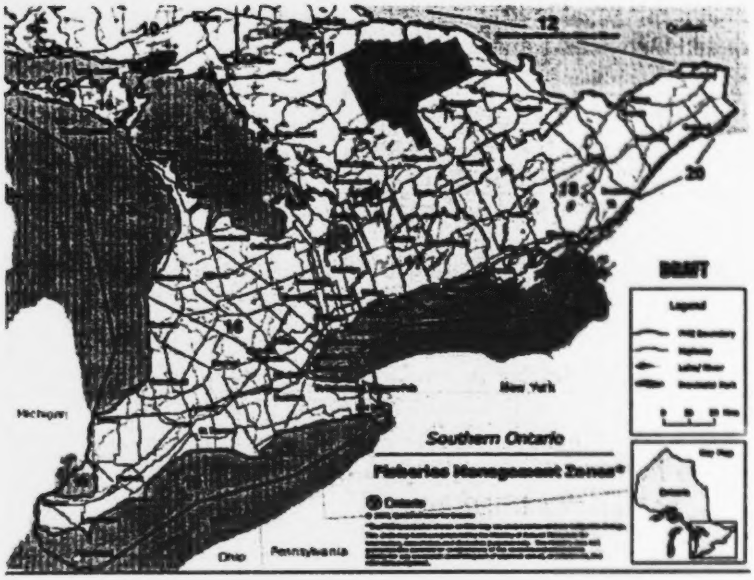

Figure 1. Southern Ontario Fisheries Management Zones showing angling boundaries that will take effect in 2007 (OMNR, 2005b).

Methods

The 2005 Angler Attitude Survey was a questionnaire that asked questions specific to fishing regulations on the St. Clair River, Lake St. Clair, Detroit River, Lake Erie, and the upper Niagara River. Anglers were encouraged to participate in the survey so that their input could be used to help guide management decisions about angling regulations, but completion of the questionnaires was strictly voluntary. Angling regulations for 2005-2006 are provided in Table 1 for reference purposes. The exceptions to the regulations are not provided in this report, but can be found in the Recreational Fishing Regulations Summary, 2005-2006, published by the Ontario government and available where fishing licences are sold.

Questionnaires were available to anglers at a bait/tackle business in Windsor on the Detroit River and a bait/tackle business at Long Point on Lake Erie. Anglers were approached by creel clerks to complete questionnaires during the Lake Erie west basin access point creel survey and during the Inner Long Point Bay roving creel survey. Questionnaires were completed and received during June, July and August, 2005.

There were two versions of the questionnaire used so that additional questions could be asked of anglers responding during the access point creel survey in the west basin of Lake Erie. The questions in the surveys pertaining to regulations were identical and therefore, responses are comparable. A copy of the questionnaire with only the angling regulations questions is included in Appendix I.

Table 1. Daily catch limits in 2005-2006 for regular licences (and conservation licences) for angling fisheries in Divisions 1 and 2.

Species	Division 1 St. Clair River, Lake St. Clair, Detroit River	Division 2 Lake Erie, upper Niagara River
Walleye & Sauger (any combination)	6(2) Open all year 4 Mar. 1 to Apr. 30, 2005 in Detroit River	6(2) Jan. 1 to Mar. 14 & 2nd Sat. in May to Dec. 31 4(2) in east basin
Largemouth & Smallmouth Bass (any combination)	6(2) Last Sat. in June to Dec. 31	6(2) Last Sat. in June to Nov. 30
Northern Pike	6(2) Open all year	6(2) Open all year[a]
Muskellunge	1(0) 1st Sat. in June to Dec. 15 Min: total length of 112 cm (44in)	1(0) 3rd Sat. in June to Dec. 15 Min: total length of 112 cm (44in)
Yellow Perch	50(25) Open all year	50(25) Open all year[a]
Crappie	No limit Open all year	No limit Open all year
Brown Trout[bc]	5(2) Open all year	5(2) Open all year[a]
Rainbow Trout[b]	5(2) Open all year	5(2) Open all year[a]
Lake Trout[b]	3(1) Jan 1 to Sept. 30 & Dec 1 to Dec. 31	3(1) Jan 1 to Sept. 30 & Dec 1 to Dec. 31
Pacific Salmon[b] (Chinook, Coho and Pink Salmon)	5(2) Open all year	5(2) Open all year[a]
Whitefish	25(12) Open all year	25(12) Open all year
Sturgeon	1(0) Open all year Catch & release in Detroit River	1(0) Open all year Closed from Peace Bridge to Niagara Falls

[a] Except Dec. 24 in Division 2.

[b] Catch and possession limits for salmon and trout combined are 5 per day with not more than 3 lake trout.

[c] Brown trout do not support a large fishery in Divisions 1 and 2 so regulations questions were not included.

The questionnaires asked a total of 15 questions about seasons and limits for 14 sport fish species targeted by anglers in Divisions 1 and 2. In questions pertaining to limits, anglers were asked to respond to what they thought the limits for a sport fishing licence should be (i.e., limits for holders of a conservation licence were not addressed). Not all anglers responded to each question and the number of anglers who did respond to the questions is provided in Table 2 for reference purposes.

Table 2. The number of anglers who responded to each survey question. The data are for all questionnaires combined, for those questionnaires completed and returned in Windsor, the west basin of Lake Erie, and Long Point Bay (roving creel and Long Point bait/tackle business combined). The possible number of responses is provided (n) and the questions are identified using key words only (see Appendix I for the complete text).

Question key words	Number of all responses (n=145)	Number of responses from Windsor (n=45)	Number of responses from west basin, Lake Erie (n=59)	Number of responses from Long Point Bay (n=41)
Walleye limit	137	45	55	37
Walleye season	129	42	51	36
Bass[1] limit	119	41	37	41
Bass season	117	36	40	41
Bass sanctuary	142	44	57	41
Northern pike limit	96	39	29	28
Northern pike season	87	37	29	21
Muskellunge limit	85	40	28	17
Muskellunge season	76	38	24	14
Yellow perch limit	139	44	56	39
Yellow perch season	135	43	53	39
Crappie limit	89	37	31	21
Crappie season	84	34	32	18
Rainbow trout limit	89	34	31	19
Rainbow trout season	81	33	32	16
Lake trout limit	68	30	21	17
Lake trout season	42	14	17	11
Salmon[2] limit	79	36	28	15
Salmon season	71	29	26	16
Whitefish limit	60	30	23	7
Whitefish season	45	21	18	6
Sturgeon limit	86	37	23	26
Sturgeon season	77	34	18	25
Number of lines	128	43	49	36

[1] includes smallmouth and largemouth bass; [2] includes Chinook, coho and pink salmon.

When asked about regulations for a particular species some anglers were not interested in the regulation and responded that they did not care what the regulation was. Although not recorded, the rationale for these responses were frequently that the angler did not fish for that particular species and therefore was not concerned with the regulation or not concerned about the potential impact a change in the regulation would have. Only those responses from anglers interested in the regulation are presented in this report.

The results are reported for all questionnaires combined. Results are also reported as a percentage of angler responses for questionnaires completed and returned in Windsor, the west basin of Lake Erie, and Long Point Bay (roving creel and Long Point bait/tackle business combined) to document any differences in angler perspective across the area that may be applicable because of locally abundant fish species (e.g., muskellunge are abundant in Lake St. Clair but not the western basin of Lake Erie, and Long Point Bay offers a unique smallmouth bass fishery).

Results and Discussion

All questionnaires combined

A total of 145 questionnaires were completed by anglers with 59 being filled in during the Lake Erie access point survey. Thirty-three questionnaires were completed by anglers who participated in the Inner Long Point Bay roving creel survey, and many questionnaires were completed at bait/tackle shops (8 were returned at Long Point and 45 were returned in Windsor).

Target fish species

The first question asked anglers what fish species was targeted when fishing in Divisions 1 and 2. Anglers could chose more than one species and a total of 15 species were identified as being targeted by at least 1 angler. Only 3 species were targeted by more than 50% of anglers: yellow perch (90%), walleye (83%) and smallmouth bass (63%).

Hahn (1991) stated that anglers groups are not homogeneous, but are separated by species preference and associated specialization, with the level of specialization being a key component of angler attitudes, preferences, expectations, etc. The preferences of anglers, listed in Table 3, may be related to locally abundant fish species, but anglers have indicated that the primary reason for fishing on Lake Erie is the proximity to their home or cottage (Cargnelli, 2002; Wright, 2006).

Table 3. Top ten fish species targeted in Divisions 1 and 2 by anglers completing questionnaires in 2005.

Fish species	% of all anglers (n=143)	% of Windsor anglers (n=44)	% of west basin, Lake Erie anglers (n=59)	% of Long Point Bay anglers (n=41)
Yellow perch	90	95	84	93
Walleye	83	100	86	59
Smallmouth bass	63	82	24	98
Largemouth bass	37	59	17	41
Rainbow trout	34	50	28	24
Northern pike	28	50	3	39
Muskellunge	25	68	9	2
Crappie	24	43	17	12
Salmon	22	36	12	20
Lake trout	15	11	10	27

The top three species targeted by area anglers, yellow perch, walleye and smallmouth bass, have not changed since the 2001 Angler Attitude Survey or the 1998 Angler Attitude Survey (Cargnelli, 2002). According to Cargnelli, this indicated that local anglers were most interested in fishing for species that were native and self-sustaining.

Yellow perch

Current regulation: Open all year; Limit of 50 (25 with conservation licence)

Most anglers (88%) supported a catch limit of at least 50 yellow perch with 66% respondents indicating that 50 perch should be the limit. Anglers did not support a seasonal closure for yellow perch (86%), however, those that did support a closure indicated it should be in place to protect spawners. Anglers not in favour of a closure stated reasons such as an abundance of perch and ice fishing as the main rationale for their decisions.

Walleye

Current Division 1 regulation: Open all year; Limit of 6 (2 with conservation licence)

Current Division 2 regulation: Open Jan. 1 to May 14 & 2nd Sat. in May to Dec. 31; Limit of 6 (2 with conservation licence) in west and central basins; Limit of 4 (2 with conservation licence) in east basin

The majority of anglers (71%) supported a catch limit of at least 6 walleye (58% supported 6), although responses ranged from minimum of fewer than 4 to an unlimited maximum. The majority of anglers (60%) also supported a seasonal closure to protect spawning walleye. Of those that supported the closure, there was no clearly supported period of time recommended other than "during spawning" or general references to dates in March. Anglers who did not support a closed season cited that equity with the commercial fishery (which has limited walleye fishing during spawning) and the abundance of walleye were the main reasons to keep the angling fishery open all year.

Bass (smallmouth and largemouth)

Current Division 1 regulation: Open last Sat. in June to Dec. 31; Limit of 6 (2 with conservation licence)

Current Division 2 regulation: Open Last Sat. in June to Nov. 30; Limit of 6 (2 with conservation licence)

Smallmouth and largemouth bass are combined in angling regulations in Ontario and 68% of anglers fishing in Divisions 1 and 2 for bass supported the current limit of 6. Most (79%) support a closed season and many recommended that the closure should protect spawners with the current season maintained. The remaining 17% of anglers supported a spring catch-and-release season for bass[1].

There are five area sanctuaries that protect spawning bass in the east basin (including Long Point Bay) of Lake Erie. Most anglers (72%) supported keeping the sanctuaries and 20% of responses requested additional sanctuaries be provided where bass spawn.

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[1] At the time of the 2005 questionnaire, Michigan, Ohio and New York State were considering a spring catch-and-release only season for smallmouth bass in the waters adjacent to Divisions 1 and 2 in Ontario.

Northern pike

Current regulation: Open all year; Limit of 6 (2 with conservation licence)

Many pike anglers supported a catch limit of 6 (63%) however 19% or respondents indicating support for a limit of 4 pike. Anglers generally did not support a seasonal closure (71%) saying that there were enough Northern pike to sustain the fishery which had small annual harvests.

Muskellunge

Current Division 1 regulation: Open 1st Sat. in June to Dec. 15; Limit of 1 (0 with conservation licence); Minimum total length of 112 cm (44in)

Current Division 2 regulation: Open 3rd Sat. in June to Dec. 15; Limit of 1 (0 with conservation licence); Minimum total length of 112 cm (44in)

The current limit of 1 muskellunge was supported by 65% of anglers, although some anglers (22%) recommended a limit greater than 1. Responses were mixed regarding the time of a seasonal closure for muskellunge, however 95% of anglers did support the closure. Approximately half of the respondents (55%) supported an opening day of the 1st Saturday in June, while 18% preferred the 3rd Saturday.

Crappie

Current regulation: Open all year; No limit on harvest

Fewer than half of anglers wanted to maintain the unlimited harvest on crappie (45%) with almost one third of respondents indicating support for a limit of 25 (31%). The majority of anglers did not support a seasonal closure for crappie (82%) citing a variety of reasons, including small sport harvests, kids target crappies, ice fishing, and the abundance of crappie, as reasons for their decisions.

Salmonids (Lake and rainbow trout; Pacific salmon)

Current regulations: see Table 1

The majority (72%) of anglers supported a limit of 3 rainbow trout, however anglers were divided about the need for a closed season (57% in support; 43% against). Those anglers that supported the closed season stated it should be in place during spawning. Very few anglers not in favour of the closure provided rationale for their perspective.

The largest proportion of anglers supported a limit of 5 rainbow trout (62%) although 19% thought the limit should be 6. Rainbow trout season is open all year in both divisions and this regulation was supported by 72% of anglers but not supported by 28% who wanted a closed season during spawning.

More than half of respondents supported the current limit of 5 Pacific salmon (65%), with 16% indicating that a limit of 6 was preferred. Most anglers (72%) were against a seasonal closure with the primarily rationale being that there were enough Pacific salmon in the populations that a closure was unnecessary. Those anglers that supported a closure recommended that it be in place during spawning.

Whitefish

Current regulations: Open all year; Limit 25 (12 with conservation licence)

Most anglers supported the current limit of 25 whitefish (67%) and the open season (64%). Of those anglers that supported a closed season the recommendation was to close the sport fishery while whitefish were spawning.

Sturgeon

Current regulations: Open all year (exceptions on Niagara and Detroit Rivers); Limit 1 (0 with conservation licence)

Anglers provided a mixture of perspectives regarding sturgeon regulations with 57% supporting a catch-and-release fishery, 34% supporting the current limit of 1 sturgeon, and 6% recommending a closed season throughout Divisions 1 and 2. When asked about a seasonal closure for sturgeon, 69% of anglers recommended a closure, however the timing of which was mixed (some anglers indicated during spawning, some indicated all year, others didn't know). Interestingly, a couple of anglers indicated their support for a closed season but recommended the closure remain as it currently existed (i.e., open all year). Those anglers who were against a closed season stated that it was because there was limited sturgeon harvest, there were enough sturgeon to support the fishery, or that they supported a catch-and-release ethic for sturgeon.

Two line exception

Current regulation: A person who is angling from a boat may use two lines in the waters of Lake Erie, except in Rondeau Bay and the Inner Bay of Long Point Bay

At outreach meetings over the past several years, anglers have approached LEMU to extend the two line exception into Lake St. Clair. For this reason, one question in the Angler Attitude Survey asked anglers for their opinion on this regulation. Anglers supported having two lines on both lakes (66%), although some anglers did indicate a preference for only one line on both lakes (24%) or recommended no change to the current exception (10%).

Questionnaires separated by region

There were some regional differences in responses obtained from anglers. Anglers who responded to questionnaires at the Windsor bait and tackle shop targeted walleye (100%), yellow perch (95%) and smallmouth bass (82%). Anglers fishing in the western basin of Lake Erie targeted walleye (86%), yellow perch (84%) and rainbow trout (28%), whereas Long Point Bay area anglers fished for smallmouth bass (98%), yellow perch (93%) and walleye (59%). Interesting differences included no targeted fishing for whitefish or sturgeon by Long Point Bay area anglers; an interest in muskie, crappie, and salmon by anglers turning in questionnaires to the Windsor bait and tackle shop; and a few lake trout anglers fishing in the Long Point Bay area.

Differences were also apparent in angler preferences for smallmouth bass with an east to west gradient in support for a closed season (98% support from Long Point Bay area anglers; 78% support from western basin anglers; 58% support at the Windsor bait and tackle shop) and a west to east gradient in support for a catch-and-release season (33% support at the Windsor bait and tackle shop; 18% support from western basin anglers; 2% support from Long Point Bay area anglers).

A gradient in responses from anglers fishing in different regions also occurred with questions pertaining to the walleye regulations. Anglers in the west were more likely to support a limit of 6 walleye than were anglers from the east (67% support at the Windsor bait and tackle shop; 69% support from western basin anglers; 32% support from Long Point Bay area anglers) and anglers from the east more frequently supported a closed walleye season (40% support at the Windsor bait and tackle shop; 67% support from western basin anglers; 75% support from Long Point Bay area anglers). These responses likely represent angler backing for the reduced walleye limit (4 for sport licence and 2 for conservation licence) imposed in the eastern basin to help rehabilitate the east basin walleye stocks of Lake Erie. Anglers were aware of, and supported, the Lake Erie Management Unit's efforts to reduce walleye harvest during the 2000-2004 rehabilitation period.

There was also a difference in the preference of anglers for the two line exception that currently exists for the waters of Lake Erie. Anglers from the Windsor area supported two lines in both Lakes Erie and St. Clair (79%), with fewer anglers recommending either one line (19%) or no change in the exception (2%). Anglers fishing in the western basin of Lake Erie also wanted two lines on both lakes (61%) with some anglers supporting only one line (20%) or no change (18%). In the Long Point Bay area, anglers showed less support for two lines (56%) and greater support for one line on both lakes (36%) compared with other locations. A recommendation for no change was supported by 8% of Long Point Bay area anglers.

Conclusions

The MNR's initiative to streamline the sport fishing regulations began several years ago and, at that time Lake Erie anglers were approached using the Angler Attitude Survey to determine what local anglers thought of the regulations. A report by Cargnelli (2002) summarized angler opinions collected in 2001, stating that 86% of anglers did not feel the regulations were too complicated, but that 87% of anglers would support an MNR-led initiative to simplify angling regulations. At that time, Lake Erie anglers were characterized as a group that tended to remain in one area of the lake in close proximity to their own backyards, homes or cottages (Cargnelli, 2002). As such, these anglers were unlikely, according to Cargnelli, to become exposed to many exceptions to the regulations because Lake Erie, in comparison to other areas of the province, had fairly simple regulations.

The Angler Attitude Survey conducted in 2005 indicated that anglers, for the most part, are in agreement with the sport regulations that are currently in place in Divisions 1 and 2. Responses from anglers did not indicate a need to make changes to regulations for the following seven sport fish species: yellow perch, bass, lake trout, rainbow trout, Pacific salmon, Northern pike, or whitefish.

Anglers supported current muskellunge and walleye limits, but showed flexibility with the closed seasons for both species. The open season was supported for crappie and anglers were comfortable with the establishment of catch limits for crappie. A variety of opinions came forward regarding the sturgeon fishery with some anglers recommending LEMU consider a catch-and-release option for sturgeon, while others wanted the opportunity to harvest sturgeon, perhaps in combination with a closed season during spawning.

Anglers also, through their responses, recommended that the two line exception be extended from Lake Erie to include the waters of Lake St. Clair.

The information contained in this report was used by LEMU staff and the Lake Manager in 2005-2006 to support decisions about angling regulations in Divisions 1 and 2 for the MNR's initiative to simplify Ontario's recreational fishery regulations. Species specific tool kits, which included recommended sport regulations, were developed by MNR and used when making decisions about the FMZ 19 regulations. The Lake Erie Management Unit also used information collected from previous angler attitude surveys, consultation with anglers at outreach meetings and open houses, and consultation with fishery representatives.

The regulations proposed for FMZ 19 for 2007 were:

Yellow perch

Proposed regulation: Open all year; Limit of 50 (25 with conservation licence)

No changes were proposed to the current regulation for yellow perch as this regulation had the support of most anglers and was consistent with the MNR approach to managing yellow perch.

Walleye

Proposed regulation: Open all year; Limit of 6 (2 with conservation licence)

This proposal represents a change to the season and limit consistent with the preferences of the majority of anglers who supported a limit 6 walleye and consistent with a streamlined approach to the regulations. It also is consistent with many anglers who did not support the closed season.

Bass (smallmouth and largemouth)

Proposed regulation: Open 4th Sat. in June to Dec. 15; Limit of 6 (2 with conservation licence)

There was a proposed change to the open season date for bass to be consistent with the MNR recommendation. The proposed date was a compromise between the regulations currently in place for Divisions 1 and 2, without putting bass stocks at risk. No changes were proposed for sanctuary areas for spawning bass in the eastern basin of Lake Erie and this was supported by area anglers.

Northern pike

Proposed regulation: Open all year; Limit of 6 (2 with conservation licence)

No changes were proposed to the current regulation for pike as this regulation had the support of most anglers and was consistent with the MNR approach to managing pike.

Muskellunge

Proposed regulation: Open 1st Sat. in June to Dec. 15; Limit of 1 (0 with conservation licence); Minimum total length of 112 cm (44in)

No changes were proposed to the current regulation for muskellunge as this regulation had the support of most anglers and was consistent with the MNR approach to managing muskellunge. Anglers fishing in the Niagara River requested the opening day remain an exception with the season being open from the 3rd Sat. in June to Dec. 15. This exception was put forward as a recommendation to be retained in the 2007 streamlined regulations.

Crappie

Proposed regulation: Open all year; Limit of 30 (10 with conservation licence)

The new limit represented a change that was consistent with the MNR tool kit and places a value on the crappie resource in FMZ 19. Almost half of the respondents were supportive of a limit for crappie. In addition, anglers consulted at various meetings and open houses indicated support for a limit.

Brook trout and Splake

Proposed regulation: Closed all year

The proposed regulations for brook trout and splake were consistent with the MNR recommendation for a species that was not present in the Fisheries Management Zone.

Brown trout

Proposed regulation: Open all year; Limit 5 (2 with conservation licence)

No change was proposed to the current regulation for brown trout as this regulation had the support of most anglers and was consistent with the MNR approach to managing brown trout.

Lake trout

Proposed regulation: Open Jan. 1 to Sept. 30 & Dec. 1 to Dec. 31; Limit 5 (2 with conservation licence)

No change was proposed to the current regulation for lake trout as this regulation had the support of most anglers and was consistent with the MNR approach to managing lake trout.

Rainbow trout

Proposed regulation: Open all year; Limit 5 (2 with conservation licence)

No change was proposed to the current regulation for rainbow trout as this regulation had the support of many anglers.

Pacific salmon

Proposed regulation: Open all year; Limit 5 (2 with conservation licence)

No change was proposed to the current regulation for Pacific salmon as this regulation had angler support and was consistent with the MNR approach to managing Pacific salmon.

Whitefish

Proposed regulation: Open all year; Limit 12 (6 with conservation licence)

This proposed change in the limit of whitefish was consistent with the MNR tool kit recommendation for conserving whitefish stocks in Ontario.

Sturgeon

Proposed regulation: Open Jan. 1 to Apr. 30 & July 1 to Dec. 31; Limit 1 (0 with conservation licence)

This change was consistent with the MNR tool kit recommendation for conserving sturgeon stocks in Ontario, while recognizing that the sturgeon population in the St. Clair River and Lake St. Clair was not at risk. It was also recommended that the exceptions currently in place on the Detroit River (catch and release only) and the Niagara River (closed) be retained.

Two line exception

Proposed regulation: A person who is angling from a boat may use two lines in the waters of Lake St. Clair and Lake Erie, except in Rondeau Bay and the Inner Bay of Long Point Bay

This proposal represented a change to include Lake St. Clair and had the support of many anglers.

By taking into account angler opinions on current and future sport regulations for Divisions 1 and 2 (soon to be FMZ 19), it is anticipated that anglers will be more likely to comply with the new regulations because they had input in the decision making process.

Overall, there were no great surprises in the attitudes expressed by anglers who participated in the 2005 survey. One reason for this is that LEMU annually goes to the angling public to hear the concerns of anglers. Where possible and supported by the resource management decisions regarding the 2007 sport fishing regulations for FMZ 19 were made to maintain or increase fishing opportunities in the waters that extend from the Bluewater Bridge at the top of the St. Clair River right through to Niagara Falls.

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Appendix I

Survey questionnaire used in 2005 to obtain opinions of anglers on the angling regulations in Divisions 1 and 2.

2005 ANGLER ATTITUDE SURVEY - REGULATIONS

In 2007, the MNR will be modernizing and streamlining provincial fishing regulations. New Fisheries Management Zones will be created based on ecological and social factors (e.g., climate zones, watersheds, fishing pressure, road networks). This will provide a clear definition of boundaries for anglers and conservation officers, allow management and monitoring at a broad landscape level, and improve customer service. Division 1 (St. Clair River, Lake St. Clair, Detroit River) will be combined with Division 2 (Lake Erie, Niagara River to Niagara Falls). Some current sport regulations in Divisions 1 & 2 are not the same. **We would like angler input on how to best combine the regulations.**

In Division 1 (St. Clair River, Lake St. Clair, Detroit River) and/or in Division 2 (Lake Erie, Niagara River to Niagara Falls) do you fish for: (check all that apply)

☐ Walleye
☐ Largemouth bass
☐ Smallmouth bass
☐ Northern pike
☐ Muskellunge
☐ Yellow perch
☐ Crappie
☐ Rainbow trout
☐ Lake trout
☐ Salmon-Chinook,Coho,Pink
☐ Whitefish
☐ Sturgeon
☐ Other (specify) ____________________

The current east basin/Detroit River daily catch limit is *4* WALLEYE with regular licence (2 with conservation licence). In the rest of Divisions 1&2 the daily catch limit is *6(2)*. Should the limit for the entire zone be:

☐ <4 ☐ 4 ☐ 5 ☐ 6 ☐ >6
☐ Other (specify) ____________ ☐Don't care

In most of Division 1 the WALLEYE season is open all year. There is a closure from March 15–2nd Fri in May in Division 2. Should there be a closed season?

☐ Yes, specify when: ____________
☐ No, specify why not: ____________ ☐Don't care

The current daily catch limit is *6(2)* BASS (largemouth & smallmouth). Should the limit be:

☐ <4 ☐ 4 ☐ 5 ☐ 6 ☐ >6
☐ Other (specify) ____________ ☐Don't care

In Division 1 BASS season is closed from Jan 1–last Fri in June. In Division 2 BASS season is closed from Dec 1–last Fri in June. Should there be a closed season?

☐ Yes, specify when: ____________________
☐ No, specify, why not: ____________________
☐ Spring catch & release only season
☐Don't care

Currently there are sanctuaries in the east basin of Lake Erie (June 1–July 15) and in inner Long Point Bay (May 15–Fri before last Sat in June to protect spawning bass. Should there be:

☐Keep as above ☐No sanctuaries ☐Don't care
☐ Add sanctuaries, specify where____________
☐ Remove sanctuaries, specify where____________

The current daily limit is *6(2)* PIKE. Should the limit be:

☐ <4 ☐ 4 ☐ 5 ☐ 6 ☐ >6
☐ Other (specify) ____________ ☐Don't care

The PIKE season is open all year. Should there be a closed season?

☐ Yes, specify when: ____________
☐ No, specify why not: ____________ ☐Don't care

The current daily catch limit is *1(0)* MUSKIE. Should the limit be:

☐ 0 ☐ 1 ☐ >1
☐ Other (specify) ____________ ☐Don't care

The MUSKIE season is closed from Dec 16–1st Sat in June in Division 1 and from Dec 16–3rd Sat in June in Division 2. What should the *opening date* in the entire zone be:

☐ 1st Sat. in June ☐ 2nd Sat. ☐ 3rd Sat.
☐ Other (specify) ____________ ☐Don't care

The current daily catch limit is *50(25)* YELLOW PERCH. Should the limit be:

☐ <25 ☐ 25 ☐ 30 ☐ 50 ☐ >50
☐ Other (specify) ____________ ☐Don't care

The YELLOW PERCH season is open all year. Should there be a closed season?

☐ Yes, specify when: ____________
☐ No, specify why not: ____________ ☐Don't care

There is no limit for CRAPPIE. Should the limit be:

☐ unlimited ☐ <30 ☐ 30 ☐ >30
☐ Other (specify) ____________ ☐Don't care

The CRAPPIE season is open all year. Should there be a closed season?

☐ Yes, specify when: ____________
☐ No, specify why not: ____________ ☐Don't care

The current daily catch limit is *5(2)* RAINBOW TROUT. Should the limit be:

☐ <4 ☐ 4 ☐ 5 ☐ 6 ☐ >6
☐ Other (specify) ____________ ☐Don't care

The RAINBOW TROUT season is open all year. Should there be a closed season?

[redacted] ☐ Yes, specify when: ____________________
☐ No, specify why not: ____________________
☐ Don't care

The current daily catch limit is *3(1)* LAKE TROUT. Should the limit be:

[redacted] ☐ <3 [redacted] ☐ 3 [redacted] ☐ >3
☐ Other (specify) ______________ ☐ Don't care

LAKE TROUT season is closed from Oct 1–Nov 30. Should there be a closed season?

[redacted] ☐ Yes, specify when: ____________________
☐ No, specify why not: ____________________
☐ Don't care

The current daily catch limit is *5(2)* SALMON (Chinook, Coho, Pink). Should the limit be:

[redacted] ☐ <4 [redacted] ☐ 4 [redacted] ☐ 5 [redacted] ☐ 6 [redacted] ☐ >6
☐ Other (specify) ______________ [redacted] ☐ Don't care

The SALMON season is open all year. Should there be a closed season?

[redacted] ☐ Yes, specify when: ____________________
☐ No, specify why not: ____________________
☐ Don't care

The current daily catch limit is *25(12)* WHITEFISH. Should the limit be:

[redacted] ☐ 12 [redacted] ☐ <25 [redacted] ☐ 25 [redacted] ☐ >25
☐ Other (specify) ______________ ☐ Don't care

The WHITEFISH season is open all year. Should there be a closed season?

[redacted] ☐ Yes, specify when: ____________
☐ No, specify why not: ____________ [redacted] ☐ Don't care

The current daily catch limit is *1(0)* STURGEON in most of Divisions 1&2. There is a closure from the Peace Bridge to Niagara Falls. Catch & release only in the Detroit River. Should the limit in the entire zone be:

[redacted] ☐ 0 [redacted] ☐ 1
☐ Closed throughout ☐ Catch & release only
☐ Other (specify) ______________ [redacted] ☐ Don't care

Other than the restrictions above, STURGEON season is open all year. Should there be a closed season?

[redacted] ☐ Yes, specify when: ____________
☐ No, specify why not: ____________ [redacted] ☐ Don't care

Currently 2 lines are permitted for anglers fishing offshore in Lake Erie. Anglers fishing in Lake St. Clair are permitted 1 line. Should there be:

[redacted] ☐ 2 lines on both lakes [redacted] ☐ 1 line on both lakes
☐ No change ☐ Don't care

Where are you fishing today?

[redacted] ☐ From Boat [redacted] ☐ From Shore

What type of fishing licence do you have for 2005?

[redacted] ☐ Resident Sport Fishing
☐ Resident Conservation Fishing
☐ Non-resident Fishing [redacted] ☐ Exempt

Which of the following areas do you regularly fish?
(check all that apply, circle locations as needed)

[redacted] ☐ Niagara River [redacted] ☐ Grand River
☐ Fort Erie to Port Dover, specify ______________
☐ Long Point Bay
☐ Port Stanley, Port Bruce, Port Burwell,
☐ Rondeau Bay, Erieau
☐ Wheatley to Colchester, specify ______________
☐ Detroit River [redacted] ☐ Lake St. Clair
☐ Thames River ☐ St. Clair River
☐ Other, specify ____________________

How many times per year do you fish in Divisions 1&2?

[redacted] ☐ Fewer than 5 trips/yr [redacted] ☐ 5-10 trips/yr
☐ 10-25 trips/yr ☐ 25-50 trips/yr
☐ More than 50 trips/yr

To help us better understand the economic importance of sport fishing, please answer the following:

How much do you spend per fishing trip on gas (boat and vehicle) and boat launch fees?(record dollar amount)
[redacted] $____________________

How much do you spend per fishing trip on bait, tackle, and licence fees? (record dollar amt) [redacted] $____________

How much do you spend per fishing trip on meals and accommodations? (record dollar amt) [redacted] $____________

What are your annual boat costs? (maintenance, repairs, dock rental, insurance, etc.)(record dollar amt)
[redacted] $____________________

What portion of your annual fishing is done on Lake Erie? (record %) [redacted] $____________________

For information on (check): ☐ Angler Diary ☐ Angler Outreach ☐ Other, specify ____________________
NAME: ______________________________ **ADDRESS:** ______________________________

The information collected on this questionnaire is collected under the authority of the Fish and Wildlife Conservation Act for fisheries management purposes. Under the Freedom of Information and Privacy Act (1987), personal information will remain confidential unless prior consent is obtained.